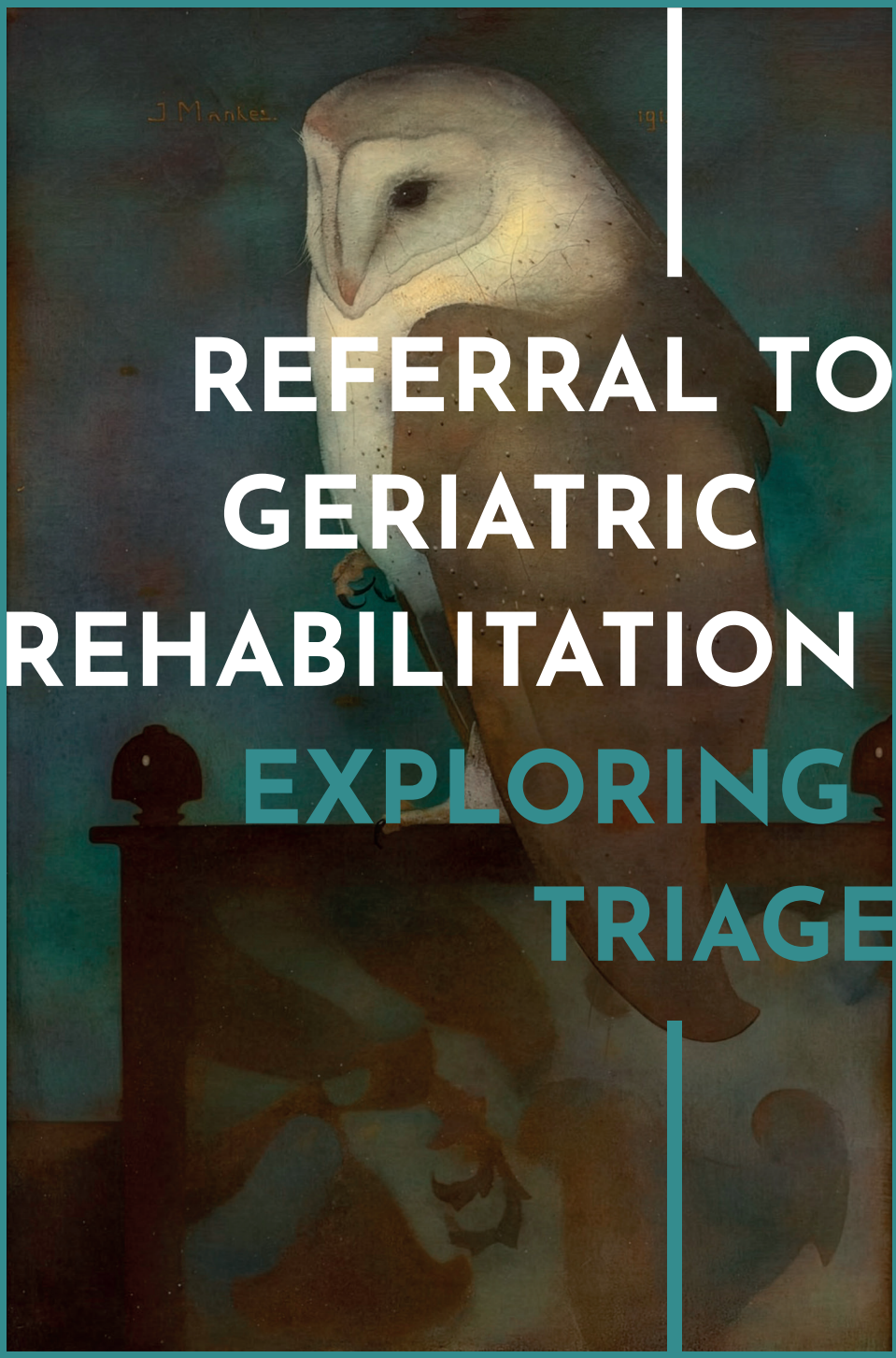

REFERRAL TO GERIATRIC REHABILITATION

EXPLORING TRIAGE

Aafke de Groot

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VRIJE UNIVERSITEIT

Referral to geriatric rehabilitation

Exploring triage

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op gezag van de rector magnificus
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volgens besluit van de decaan
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Aafke Johanna de Groot

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promotiecommissie:	prof.dr. C. Wagner prof.dr. J. Schols prof.dr. J. Visser-Meily dr. H.C. Willems prof.dr. B.M. Buurman-van Es

voor David

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CHAPTER 1

INTRODUCTION

The aging of the population has challenged healthcare workers to perceive, understand and address the specific health-related needs of older adults and adapt care practices accordingly (Puts et al., 2008). Older adults frequently present with atypical complaints originating from covert and complex health problems that underly a vulnerability to adverse outcomes of hospital stay, such as functional decline and institutionalization (Covinsky et al., 2003; Gregorevic et al., 2016; Meyboom-de Jong, 2014; van Seben et al., 2019). As a consequence of the aging society the need for follow-up care for older and vulnerable adults after hospital discharge, i.e. 'sub-acute' or 'post-acute' care, has substantially increased. Such short-term follow-up care services could be characterized as 'rehabilitation oriented' when a return to the original living situation is the underlying goal of care.

To introduce geriatric rehabilitation as such we first present a short overview of the history of short-term care development in nursing homes in the Netherlands. In the next paragraphs we describe how formal installment of geriatric rehabilitation care (GR) in the Dutch healthcare and its subsequent growth led to the research questions on access to GR we studied in this thesis.

'Somatic' rehabilitation.

Nursing home care in the Netherlands was founded in 1967 by installment of the Long Term Care Act (Algemene Wet Bijzondere Ziektekosten) and defined as 'residential care for older people, who need nursing and medical care, not requiring hospitalization'. Care needs of nursing home patients were categorized into 'somatic' or 'psychogeriatric'. In the decades that followed, nursing homes developed multidisciplinary expertise in long term care for generally older adults with complex care needs. Apart from these internal developments, nursing homes served as a societal safety net in Dutch healthcare, answering to the demands of diverse patient populations over time, such as patients with severe brain injury or with young- onset dementia (Kohnen et al., 2018; Mulders et al., 2014), (Koopmans et al., 2017). In the last decades of the twentieth century, rapprochement with hospital specialists led to the introduction of 'short-term' care trajectories in nursing homes, 'somatic rehabilitation', that focused predominantly on orthopedic trauma patients (van Balen et al., 2002). These 'early' geriatric rehabilitation trajectories in nursing homes were embedded in wards for long-term somatic care and the opportunities to create an overall rehabilitation-oriented environment were restricted. 'Hands-on therapy' hours were limited and not earmarked for rehabilitation patients (Leemrijse et al., 2007).

In the new millennium, the worldwide increasing demand for short-term nursing home care led to societal and academic discussions concerning the target group for geriatric rehabilitation trajectories and the quality of therapeutic programs ("Boston Working Group on Improving Health Care Outcomes Through Geriatric Rehabilitation," 1997). In 2011 and 2012 a nationwide study monitored the development of geriatric rehabilitation care in the Netherlands with nursing homes, rehabilitation facilities, hospitals and health

insurance companies as partners and stakeholders (Achterberg, 2013; Holstege et al., 2017). Subsequently, geriatric rehabilitation care in nursing homes was expelled from long-term care regulations and reinstalled under the Healthcare Insurance Act concerning its governance and funding. In these years the Dutch care system for older adults was thoroughly reconstructed, following the concept of 'Healthy Aging' and 'Aging in place' (Coleman, 1995; Maarse & Jeurissen, 2016; Marek et al., 2012). Access to long-term care was considerably restricted, whereas the transition of short-term nursing home care to the Healthcare Insurance Act, confirmed that such short-term care in nursing homes was regarded a 'curative' health provision (Zorginstituut, 2023). Geriatric rehabilitation trajectories executed under these new regulations thus became reimbursed as medical procedures under diagnostic codes.

Developments in geriatric rehabilitation

Restoration of functional capacity and optimization of social participation, in a fashion contributing to personal well-being, became the overarching aim of GR treatment ("Boston Working Group on Improving Health Care Outcomes Through Geriatric Rehabilitation," 1997; de Groot & Vreeburg, 2019; van Balen et al., 2019). Previous (inter)national studies had reported effectiveness of geriatric rehabilitation and treatments were adapted to the specific needs of older and/or vulnerable adults (Bachmann et al., 2010; Bean et al., 2019; van Dam van Isselt et al., 2019). Such multifaceted geriatric rehabilitation programs would be 1) embedded in a rehabilitation environment; 2) goal-oriented; 3) personalized and 4) regularly evaluated with the team, the patient and family (Achterberg et al., 2019). The GR target group was defined as being older, vulnerable and multimorbid patients with acute or sub-acute functional decline due to trauma, orthopedic surgery, amputation or acute neurological disease, such as stroke or brain injury. Patients with an acute internal medical illness were granted access to GR trajectories as well when their physical condition and functional status was gravely affected. However, all of these patients were eligible for GR only when they were expected to profit from multidisciplinary treatment and rehabilitation-oriented care, in other words, when their functional prognosis appeared to be favorable concerning a return to community living. This restricted access to geriatric rehabilitation care and the means to establish rehabilitation eligibility of patients has become a subject of discussion since.

A European survey, followed by a consensus procedure on the characteristics of geriatric rehabilitation was held amongst rehabilitation professionals across European countries. Seven (7) statements on 'selection' of GR candidates were agreed upon (van Balen et al., 2019). These statements referred to 1) age (>70 years); 2) the acute decline in function; 3) pre-morbid frailty or impairments; 4) limited exercise tolerance; 5) expectation of improvement; 6) evaluation of the referral process between hospital and rehabilitation services (triage) and 7) access to GR of all patients with low-energy hip fractures, either delivered as in- or outpatient care. In that same year, the Dutch Consortium of GR

stakeholders published a position paper in which a research agenda was set that held 'triage' as one of the main themes (Verenso, 2019).

Triage and formal access to geriatric rehabilitation

Over 50.000 GR trajectories were registered in The Netherlands in 2019, see Figure 1. A vast majority of these patients is admitted to geriatric rehabilitation after an acute hospital admission. When discharge directly home is not advisable and hospital treatment is concluded, nurses who are specialized in transitional care ('liaison nurses') are assigned to the case. These nurses assess the patients' eligibility for GR ('triage') and match GR candidates with post-acute care providers. During the triage decision making process, liaison nurses may choose to consult a GR professional. After transfer of the patient the physician attending to the patient in post-acute care formally issues the medical grounds for the GR trajectory to receive reimbursement. Patient complexity and alleged absence of achievable rehabilitation goals are reasons for post-acute care providers to refuse placement of GR candidates proposed by transfer nurses. Communicational problems between settings, such as inadequate transfer of patient information can cause refusal of patients as well (Lawrence et al., 2018).

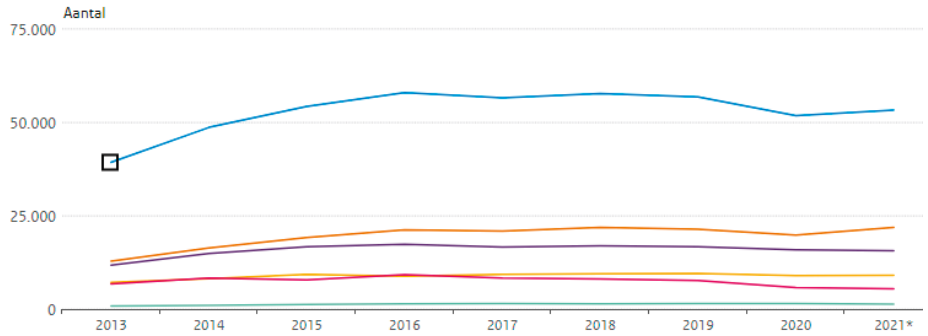

Figure 1. Total number of geriatric rehabilitation patients in the Netherlands (blue) with diagnostic target groups: amputations (green), planned orthopedic procedures (red), neurological (yellow), trauma (brown), miscellaneous diagnoses (orange). Source https://www.staatvenz.nl/kerncijfers/geriatrische-revalidatiezorg

The decision making process concerning referral to geriatric rehabilitation as the appropriate post-acute care decision is referred to as 'triage'. A GR triage decision would be preceded by a patient assessment, necessary to decide whether GR treatment indeed could answer to the needs of the patient (McVeigh & Caplan, 2015; Najem et al., 2018). GR-triage decision making thus involves both hospital and rehabilitation expertise. Cooperation between these two settings based on consensus concerning triage content would support the quality of decision making and the transparency of the process for patients and families. Apart from alleged professional discrepancies in assessing rehabilitation eligibility, conflicting organizational interests between sending and receiving

institutions can influence decision making in a covert way (Buntin, 2007; Lawrence et al., 2018). Hospitals need empty beds for newly arriving patients; they are held accountable for 'bed days' of patients that are waiting for transfer. Care facilities would feel an urge to carefully select eligible patients, as they are held accountable for the outcome of the GR trajectories, such as the percentage of patients discharged home and the mean duration of the rehabilitation trajectory.

Triage instrument

In 2013, when geriatric rehabilitation was first installed in the Netherlands, a triage instrument was developed by the Dutch professional association of elderly care physicians (Verenso, 2013). This instrument was intended to support 'sending' and 'receiving' professionals in reaching mutual agreement in triage decisions. To that purpose it defined six triage themes or criteria to deliberate. Medically stable hospital patients would qualify for GR when they 1) were vulnerable, 2) had rehabilitation needs and 3) had 'a positive functional prognosis', meaning that functional recovery and return to the original living situation was expected. In addition, to qualify for GR, 4) a patients' cognitive status ('learnability') and 5) his 'endurance' for the physical burden of rehabilitation therapy were to be sufficient to participate in GR treatment, although in the meantime cognitive status and endurance would have to be insufficient for medical specialist rehabilitation that has more demanding therapy programs in these respects. Lastly, the proposed GR patient was expected to be 6) motivated or show 'motivational capacity' to actively partake in rehabilitation treatments. Patients with rehabilitation needs together with persistent chronic care needs were to receive rehabilitation treatment within a chronic care setting.

Rehabilitation-oriented post-acute care

In 2017 a new form of inpatient rehabilitation-oriented care, short-term recovery care (STRC), was introduced in Dutch healthcare. STRC consists of temporary supportive nursing home care for older adults with general health problems that would not need hospital treatment or geriatric rehabilitation (van den Besselaar et al., 2021). This type of short-term inpatient care could be accessed from home ('step-up') or from hospital ('step-down'), when requested by the referring physician. It has no earmarked triage procedure. STRC is qualified as 'regular' or 'complex', the former mainly consisting of supportive care on demand and the latter implying constant nursing attendance together with medium-intensity options for medical treatment. Table 1. shows an overview of rehabilitation oriented post-acute care in the Netherlands. A post-acute care decision aid was developed in 2017 by the Ministry of Healthcare in cooperation with professionals. In contrast with the geriatric rehabilitation focus of the Verenso triage instrument, this new decision aid provided guidance for all available short-stay post-acute care options by means of questions and general criteria for 'appropriate care' (Remmerswaal, 2017).

Table 1. Some characteristics of rehabilitation oriented care in the Netherlands

Type of post-acute care (instituted in NL since)	Medically supervised by	Case-complexity[1]	Multi-disciplinary team	Treatment (hours/week)	Duration of inpatient trajectory (2019) (mean, days)
Community rehabilitation	General practitioner	Low	PT, OT, ST treatment	Depending on health insurance	Not applicable
Short-term residential care- regular	General practitioner	Low-medium	PT treatment, OT, dietician consultation	<0.5[2]	34
Short-term residential care-complex	Elderly care physician	Medium-high	PT, OT treatment, Dietician, psychologist, ST consultation	≤1.5	34
Geriatric rehabilitation	Elderly care Physician or GR nurse specialist	High[3]	PT, ET, dietician, ST, psychologist treatment.	≤4	43
Rehabilitation in Long-term care	Elderly care physician	High	PT,ET, dietician, ST, psychologist treatment	≤3	No data available
Specialist rehabilitation	Physiatrist[4]	Specialist rehabilitation needs		≤28	21-36

PT=physiotherapy. OT=occupational therapy. ST=speech therapist.
1. Comorbidity and geriatric syndromes complicating functional recovery. 2. GP hours not included. 3. Case complexity of elective orthopedic GR-patients is subject to debate. 4.Rehabilitation specialist.

Up till now, the STRC decision aid nor the Verenso triage instrument for geriatric rehabilitation have been evaluated concerning feasibility, validity or efficacy. As patient flow between hospitals and sub-acute care increased over the years, triage stakeholders, such as hospitals, hospital professionals, rehabilitation teams, post-acute care providers and health insurance companies repeatedly expressed that referral decisions were volatile and too much based on clinical intuition. International literature reported comparable concerns on the subject (Aramini et al., 1992; Isbel & Jamieson, 2017; White et al., 2019). In the Netherlands, the increasing number of patients referred to rehabilitation oriented post-acute care emphasized a demand for clarification of post-acute care triage criteria. Evaluation of triage methods and the geriatric rehabilitation triage instrument seemed expedient.

Subject and aim of this thesis

The subject of this thesis is the content and process of assembling the appropriateness of a geriatric rehabilitation trajectory, triage. As a GR referral decision results from a rehabilitation assessment, we studied this triage assessment primarily as a competency based task, founded on evidence, clinical experience and professional consensus. As a secondary angle we addressed the 'transmural' interplay of triage decisions and the organizational dilemmas concerning hospital discharge and admission to the next level of care (Zimmermann et al., 2019). In this approach triage is regarded a clinical task under managerial pressure and intertwined with interests, not strictly associated with individual patient care (Aase & Waring, 2020). This study means to contribute to the quality of referral decision making by defining the core elements of the multilevel 'triage' process with its professional and organizational aspects in a conceptual model for best practice.

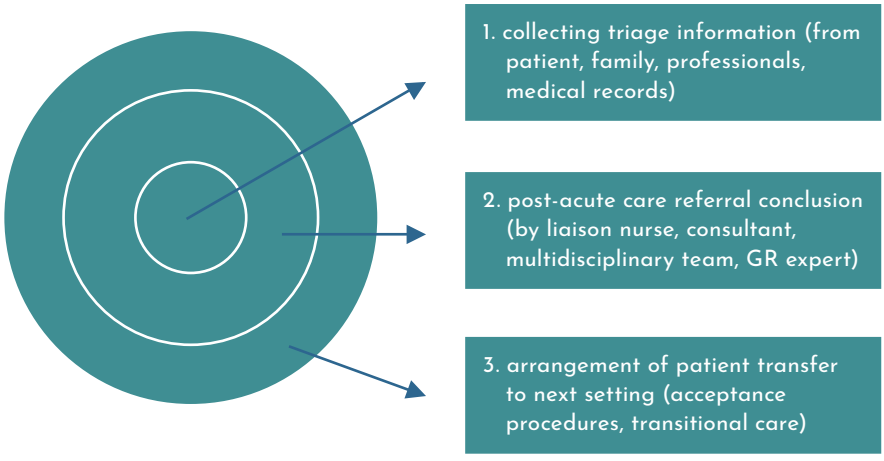

Figure 2. Triage concerning referral and transfer to geriatric rehabilitation

To represent the professional aspects of a triage assessment in a model (figure 2) we assumed that triage starts with 1) the retrieval of relevant information on medical background, care needs and personal rehabilitation goals. This information is collected in direct conversation with patient, family and attending professionals as well as extracted from medical records. After balancing the relevant patient information, 2) a post-acute care referral conclusion is reached. Agreement on transfer to the appropriate (next) level of care finalizes the triage process and is followed by 3) transitional care procedures.

In this theses we explored what is assessed in a triage process, how the assessment is done, why it is done that way, who are involved in the process and how principal actors participate and cooperate in triage decisions.

To this aim we defined the following research questions:

1. What are patients attitudes and thoughts regarding follow-up care at hospital discharge?
2. What items, instruments and methods concerning referral of hospital patients to GR are reported in literature?
3. What are the characteristics of hospital patients referred to GR in comparison with patients not referred?
4. Which hospital and/or rehabilitation professionals are involved in GR referral decision making and what triage items and methods are used?
5. What are core elements of a best practice referral to GR in the Netherlands?

In Chapter 2 we present a qualitative study exploring the considerations of older post-operative patients regarding follow-up care. (Question 1)

Chapter 3 is a scoping review that holds a literature overview of factors concerning referral of hospital patients to geriatric rehabilitation. (Question 2)

In Chapter 4 and 5 we report on the characteristics of patients, participating in the DSMS-19 cohort. In this cohort we studied characteristics of hospital patients referred to geriatric rehabilitation and the course and outcome of their care trajectory, focusing on triage factors, such as multimorbidity and vulnerability. (Question 3)

In Chapter 6 we report the results of a national survey concerning professional involvement in GR referral decision making and methods of triage. (Question 4) This survey addressed clinical and organizational factors in decision making by hospital and rehabilitation professionals.

Chapter 7 is a general discussion on the subjects in this thesis. In this chapter a conceptual triage model (Question 5) is presented, together with future perspectives concerning referral to GR and triage.

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CHAPTER 2

OLDER SURGICAL PATIENTS' PREFERENCES FOR FOLLOW-UP CARE AFTER HOSPITAL DISCHARGE: A MULTI-METHOD QUALITATIVE STUDY INTO THEIR UNDERLYING NEEDS

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International Journal of Nursing Studies Advance. 2025

Abstract

Background
Almost 30% of older patients suffer from functional decline during hospital stay which often makes follow-up care decisions necessary. However, little is known about the topics that are relevant to these patients and their families to address in discharge conversations.

Objective
This study aims to provide insight into the perspective of older surgical patients on follow-up care by exploring their considerations expressed throughout the process of discharge planning.

Design
A multi-method qualitative study

Participants
Participants were older patients from a surgical ward who anticipated to require follow-up care after discharge.

Methods
Data collection included: 1) interviews with patients; 2) informal conversations with family members and professionals; 3) non-participant observations during medical rounds and bedside conversations; 4) extraction from medical records. In all data sources, the focus was on capturing the patients' considerations with regard to follow-up care. We employed inductive thematic analysis to identify needs that underlie patients' preferences for follow-up care.

Results
Twelve older surgical patients with complex or delayed discharge were followed. Their considerations with regard to follow-up care revealed five underlying needs: 1. Safety (adequate care), 2. Familiarity (trusted people and surrounding), 3. Independence (active and autonomous living), 4. Continuity (resume previous life) and 5. Relief (ending endurance). Most participants had more than one need.

Conclusions
Older surgical patients' perspective on follow-up care can be captured by five underlying needs. Gaining insight into these needs contributes to a better understanding of patients' preferences for follow-up care. We therefore recommend exploring these needs in older surgical patients, as well as identifying potential similar or additional needs for other subgroups of older hospital patients, as an important step toward personalized decision-making in transitional care.

Introduction

Almost 30% of older patients suffer from functional decline during hospital stay, causing temporary or structural impairments in activities of daily living. As these impairments could hinder immediate independent living after discharge, the end of a hospital episode can mark the beginning of personal adjustment to home care support or imply admission to a care facility for further recovery (Gabrielsson-Järhult & Nilsen, 2016; Galvin et al., 2017; Sorkin et al., 2018). The episode after hospital discharge may thus mark important transitions in the lives of older patients.

To support older patients during these transitions, extensive research has been done on their discharge process from hospital. Initially, studies predominantly focused on (personalized) discharge planning as an intervention to prevent adverse outcomes of care. Cohort studies found mixed results: Braet and colleagues reported positive effects on readmission rates, whereas a Cochrane review found little evidence on length of hospital stay and readmission rates comparing personalized with standard transitional care (Braet et al., 2016; Gonçalves-Bradley et al., 2022). To improve transitional care, interventions are recommended that start well before discharge and include communication with the family (Bauer et al., 2009).

Other hospital discharge studies have also addressed the satisfaction and involvement of older patients and their family caregivers in the hospital discharge process. Studies have focused on topics such as readiness for discharge, discharge communication and shared decision making (Burke et al., 2018; Fiore et al., 2012; Galvin et al., 2017; Graham et al., 2024; Hesselink et al., 2012; Hoefel et al., 2020; Mabire et al., 2016; Manhas et al., 2020). In short, recommendations from these studies suggest that patient and caregiver should be equal and well-informed partners in conversations on hospital discharge planning (Mennuni et al., 2017).

These recommendations are in line with the view that shared agreement applies to follow-up care decisions as well as to other treatment decisions (Ottenvall Hammar et al., 2014). This principle is affirmed when discharge conversations openly address all topics of discharge and follow-up care relevant to patients and their families. However, little is known about the topics that are relevant to older hospital patients for whom follow-up care is unavoidable. Which topics should these specific discharge conversations openly address?

We do know that in a discharge process, preferably, time should be allocated to explore the patients' preferences for further treatment by asking questions that reveal their perspective on their own recovery. Issues that may arise are how the period after leaving the hospital is perceived and the extent to which the patient feels ready for discharge (Gadbois et al., 2017; Gadbois et al., 2019; Heppenstall et al., 2014).

In addition to existing knowledge, we want to further explore the older patients' perspective on follow-up care after hospital discharge. We have chosen to focus our study on the subgroup of older hospital patients who had undergone major surgery, hereafter referred to as 'older surgical patients'. As these patient group require a wide range of post-acute care needs, including specialist homecare, rehabilitation oriented post-acute care or palliative care, they also may provide information on the perspective of older hospital patients in general.

Hence, this study aims to gain a comprehensive understanding of older surgical patients' preferences for follow-up care by exploring the considerations they express throughout the process of discharge planning. What are their wishes, uncertainties and concerns regarding follow-up home care and (temporary) residential care? Which needs may account for their preferences for a special type of follow-up care? Exploring these considerations among older surgical patients is expected to contribute to decision-making in transitional care for older hospital patients in general.

Materials and methods

Design

This study used a qualitative, multi-method design, that incorporated interviews, observations, and the extraction of medical records. It involved four months of fieldwork studying older surgical patients' considerations during the process of hospital discharge planning. The multi-method approach was chosen to gather information from as many sources as possible on what patients considered throughout this process.

The authors formed the research team with qualitative expertise (B, C, E), qualitative research training (A), and medical or geriatric rehabilitation expertise (A, D, E).

Setting

Data were collected on a 24-bed surgical ward in a tertiary hospital, treating patients with inflammatory bowel disease, colorectal tumors or neuro-endocrine oncological disease. The average patient turnover on this hospital ward was over five per day. Post-operative care typically covered 3-5 days of in-hospital recovery. When discharge home was deemed unsafe, a liaison nurse was involved to arrange follow-up care. The professional team consisted of surgeons (head practitioners), residents, specialized and junior nurses, allied health care professionals, and medical consultants.

Several aspects of the workflow were relevant in assessing patients' considerations in discharge planning. Nurses were assigned to new patients daily, based on individual case complexity, balancing the workload across the nursing team. This may have limited continuity of care and opportunities to develop familiarity with patients. In addition, reports on patients' considerations related to discharge and follow-up care were

documented in their medical records. Lastly, transitional care and discharge discussions were often conducted on short notice, typically without family present.

Sampling

We used purposeful sampling with a focus on older patients that were expected to require some sort of follow-up care, as we strived for information rich cases in terms of hospital discharge considerations. Therefore, criteria for inclusion were: older patients (>55 years) for whom 1) discharge planning had started, and 2) discharge to follow-up home care or temporary residential care was foreseen. Patients were not eligible for inclusion when 1) they were too weakened to provide written consent or participate in an interview, 2) decisional incapacity prevented them from participating, or 3) 'not speaking XXXX or English' would hinder participation in the study. Based on these criteria, eligibility for the study was assessed by an attending physician or resident, in consultation with the researcher (A) conducting the fieldwork. She was present during rounds three days a week to assist with recruitment. To keep the data collection manageable, a maximum of 2 patients were followed at the same time. When a patient was deemed eligible, the attending physician introduced the study during a bedside consultation and asked permission for the researcher to start the informed consent procedure.

Of all patients approached by the researcher only two refused to participate, with no further explanation beyond their unwillingness. Another six patients consented to participate but could not be included due to: (1) the development of delusional complaints, (2) change in severity of illness preventing further participation, (3) withdrawal of initial informed consent and (4) transfer to another hospital ward. One participant (P4) was adamant in referring us to his partner to be interviewed because Dutch was not his first language and engaging in a longer conversation would be exhausting.

Twelve patients were included in the study, six women and six men. Their mean age was 70 (55-82) years. Ten participants had undergone abdominal surgery and two had been surgically treated for a neuro-endocrine disease. Their hospital stay varied from 6 days to 67 days (see table 1). Three participants were admitted more than once.

Table 1. Characteristics of included patients

	Age	Sex	Living situation	Admission	Surgical procedure	Days in hospital	Follow-up care
P1	70-75	F	with partner	acute	abdominal	6,7,9[1]	home care
P2	55-60	F	living alone	acute	abdominal	18	geriatric rehabilitation
P3	55-60	M	with family	sub-acute[2]	endocrine	19	home care
P4	55-60	M	with partner	acute	abdominal	58	geriatric rehabilitation

Table 1. Continued

	Age	Sex	Living situation	Admission	Surgical procedure	Days in hospital	Follow-up care
P5	70-75	F	with partner	acute	abdominal	67	geriatric rehabilitation
P6	70-75	F	with partner	elective	abdominal	14	home care
P7	65-70	M	living alone	elective	abdominal	8	home care
P8	60-65	F	living alone	elective	abdominal	25	home care
P9	70-75	F	LTC-facility[3]	acute	abdominal	23,16[2]	long-term care
P10	80-85	M	living alone	sub-acute[2]	endocrine	7	home care
P11	80-85	M	with partner	elective	abdominal	63	geriatric rehabilitation
P12	75-80	M	with partner	elective	abdominal	8,6[2]	geriatric rehabilitation

1. Readmitted after initial discharge home. 2. Priority admission: within days. 3.LTC=Long-term care

Data collection

Data collection took place from September to December 2021, and included: 1) interviews with patients; 2) informal conversations with family members and professionals; 3) non-participant observations during medical rounds and bedside conversations; 4) extraction from medical records. In all data sources, the focus was on capturing the patients' considerations with regard to follow-up care. To the extent that family members and health professionals were used as sources, these represented indirectly expressed considerations.

Interviews

Formal interviews were conducted with patients, guided by a topic list exploring their considerations regarding follow-up care (see suppl. A). These interviews lasted between 15 to 20 minutes, were audiotaped, and transcribed verbatim. In the two cases where audiotaping was declined, notes were taken and the content was written up immediately after the interview.

Informal conversations with family members and professionals

Informal conversations with family members and professionals were conducted to understand the considerations patients expressed to them during the process of discharge planning. To increase the likelihood of speaking with them, we opted for unscheduled 'go-along' interviews. These conversations were guided by open questions concerning the patients' view on follow-up care. They lasted between 5-20 minutes and were not audiotaped; a report was written immediately after each conversation.

Non-participant observations of medical rounds and bedside conversations

Observational data were collected during daily medical rounds, when discharge plans for included patient were discussed between nursing and medical staff. Additional observations focused on bedside conversations on discharge and follow-up care between the attending physician and the patient. These conversations lasted between three and ten minutes, with a family member occasionally present. Field notes of both types of observations were written within the hour and summarized into reports on a regular basis. As a non-participant observer the researcher had minimal influence on the data collected.

Medical records

Medical records were screened for professionals' notes referring to the patients' perspectives on discharge planning and follow-up care, and relevant data were copy-pasted. The professionals whose notes were included were nurses, physicians, allied healthcare professional, and medical consultants.

An overview of the data collection for each case is provided in Suppl. B.

Data analysis

We combined the data from interviews, informal conversations, observations, and medical records into a single chronological dataset per patient. Since the data collection method did not significantly impact the analysis, we treated the datasets as integrated, without focusing on individual sources. In other words, each patient's case history was formed with input from the patient, family, and professionals.

To analyze these individual case histories, we used thematic content analysis, which allowed us to identify recurring themes and underlying patterns inductively (Braun & Clarke, 2006). Firstly, two researchers (A, B) familiarized themselves with the data by reading and rereading the case histories. Data reflecting the participants' perspective were independently selected and coded (A, B). Next, based on the open coding of the case histories, data was taken to a higher level of abstraction by writing case-specific memos on the participant's considerations on follow-up care (Birks et al., 2008). Two examples of such memos are provided in suppl. C. In the third step, coded considerations and memos were compared and discussed between cases (A, B, C), leading to the preliminary identification of themes related to the needs underlying participants' considerations. Finally, the results were discussed within the research team leading to consensus on merging the themes into main needs. All data analysis steps were discussed with the research team (A, B, C, D, E). An overview of codes, themes and main themes emerging from the individual case histories is provided in suppl. C. In the reporting of the study we adhered to the COREQ guideline.

Ethics

The medical ethics review committee (METC) of Amsterdam University Medical Center approved the study protocol (METC file no. 2020.302). Prior to data collection written informed consent was obtained from the nursing staff and the permanent medical team of the ward. All other participating professionals, as well as the included patients and their family members, provided written informed consent when they became involved in the data collection.

Results

Analysis of participants' considerations concerning follow-up care identified five underlying needs: 1. Safety, 2. Familiarity, 3. Independence, 4. Continuity, and 5. Relief. In the data presented, we specify the participant to whom the considerations pertain, as well as the source of the considerations (interview with patient, conversation with family or professional, observation of medical round or bedside conversation, report in medical record).

1. Safety

All participants had recently undergone major surgery. When thinking of hospital discharge and follow-up care, a first important need was to feel safe and be strong enough despite their vulnerable condition. Participants expressed that they wanted to go home if they had recovered well enough and when proper, secure and adequate medical care was arranged at home so that no mishaps or complications would occur. When prompted, participants mentioned to worry about nursing aids for their colostomy, tube feeding arrangements, the proper wound care, their medication and the follow-up surgical treatment.

> *'Like this I cannot leave the hospital. The doctors talk about going home, but first of all my bowels (intestines) must be in order. Me and my husband we can take care of it [the colostomy], though the pouching system they use here is different.' [P6, interview with patient]*

> *'She insisted constantly that we restart her old medication and take care of the old fistula.' [P6, observation medical round].*

> *'She needed reassurance and explanation more than once.' [P6, nurse report]*

> *'She considers that having time for recuperation would be beneficent for her, but on the other hand she would prefer to go home would that be possible. The vacuum-assisted closure (VAC)-pump treatment, however, every third day and very painful, urges her to prefer in-patient post-acute care (in a nursing home)' [P2, nurse report]*

> *'I am very worried about the endo-procedure he [P4] needs. He would have to be transported twice a week from the rehabilitation facility back to the hospital. He is not capable of doing that, it would be too much of a burden.' [P4, conversation with partner]*

Some participants knew from experience how helpless and desperate one feels when no help is at hand in an emergency situation. They didn't want to go through that again and preferred a temporary stay in a skilled nursing facility.

> *'I will absolutely not go directly home from here; what happened at home earlier scared us. I meant to get up, then suddenly I became unwell and ended up on the floor! My wife could not help me, she has a heart condition. We telephoned the family doctor and he had me re-admitted at once. Now I need to have my intestines functioning before I go home. I need physiotherapy and a fortnight stay in a nursing home, to rest. In a hospital there is no chance of resting. My wife said: "Of course I want you home, but you need recovery first".' [P12, interview with patient]*

> *'Eleven years ago I went through the same experience. Six months it took me then, slowly recovering at home, assisted by home care workers. At eleven o'clock in the evening the last of them left and I was alone for the night. Well, back than I was 10 years younger, now it feels quite different. I have reconsidered, I would prefer to go home straight, but then I will be alone at night.' [P8, interview with patient]*

Being in a nursing home was not entirely reassuring in itself. One participant was afraid that prompt availability of care was not guaranteed when she would suddenly need assistance there.

> *'How do you feel about going to a nursing home?' 'It scares me' 'Does it scare you?' 'Yes, I am afraid that I am left waiting. That they are not attentive so that it takes a long time waiting for help. That they don't notice my call for help.' [P8, interview with patient]*

2. Familiarity ('familiar-ness')

Pondering on the end of hospital stay, a need for familiar surroundings and familiar people helping them was expressed as well. In some cases this was a strong desire to be with their own, familiar and trusted people once again. One participant consented with any given post-acute care planning as long as he could leave without delay and go home, in his case a farm where he had lived all his life.

> *'He has had a tremendous outburst, he cannot stand being here for so long and he misses his family very much.' [P3, observation medical round]*

He is frustrated that he was told that he could go home, but then the next day the decision was withdrawn and this happened more than once. His family cannot visit often, this adds to his feelings of frustration and anger. But in the end he admitted that discharge would also have to be safe'. [P3, nurse report].

The need for familiarity of another participant was expressed in her wish to be supported only by her husband and daughters after discharge. For her, formal home help was acceptable only in case her family wouldn't have the expertise to nurse her.

'I very much long to go home!' 'What will you need to recover at home and regain strength?' 'My husband will help me, he and I will take walks together. He will take care of me when I get home. He makes a delicious soup and together we will manage.'... 'Do you need help from homecare workers?' 'Absolutely not! Me and my husband, we can easily manage together, the wound is simple this time'. [P6, interview with patient]

In contrast the need for familiarity can also lead to a wish to postpone discharge. After a three week stay in intensive care followed by an even longer stay at the ward, one participant felt that the hospital department and team had become so familiar that he preferred to stay there, instead of being transferred to a new environment.

'The departure and goodbye from the team is very emotional, he will miss us all very much. Going to a new place is stressful. He and his partner feel defeated, it is all going so fast.' [P4, nurse report]

3. Independence

A third category of considerations showed the need and desire to be independent, to experience freedom and autonomy and to spend the day according to one's own choice and go wherever wanted. When confronted with hospital discharge, these participants expressed their wish to be independent again, to be free and on their own. In these considerations, concerns about fear to have lost the necessary (physical) independence were uttered as well.

One participant feared to be sincerely patronized in hospital and had postponed a necessary surgical treatment for years. Once in hospital, he wanted to be liberated from the unwanted interference of others in his lifestyle as soon as possible and left the hospital without waiting for prescriptions of medication.

'Yes, after this weekend, there is a chance I can go home. I am absolutely ready for that! I dreaded the dependency in being a hospital patient. I cherish my privacy and I like being on my own, I want to be able to smoke again [shows Nicotine bandage]'. [P9, interview with patient]

The need for freedom and independence could also be an expression of a deeply felt desire to be active, to be up and about. For these participants a physical condition allowing for independent mobility was pivotal whereas to them the prospect of needing nursing home care would imply living a dependent and passive life.

> *'For me, this diagnosis [a malignant tumor] is bad news; I fear going home towards a future with this.. maybe I must realize the facts: my time is over. I used to work with quite a few older colleagues and they are all in residential care homes now, passively sitting and nothing ever happens.' [P10, interview with patient]*

> *'I know for certain that he will not want to go to a nursing home. That is not adequate for him, that really does not suit him, mentally spoken'. [P11, conversation with nurse]*

> *'They ask me whether I can stand it, but they don't ask him! It is such a hardship for him, he is such an active person and now he has been constrained to bed for seven weeks'. [P11, conversation with partner]*

The need to live independently was an influential motive in considerations of participants. Not being able to live an independent life again would make their life unbearable. One participant eventually complied with a temporary stay in a nursing home, after an earlier statement that he would prefer death if it came to that.

> *'At the family meeting he was very clear, he wanted to go home or die; not go to a nursing home'. [P11, conversation with physician]*

4. Continuity

A fourth need underlying participants' considerations on discharge was to experience continuity. We appreciated this as a strong wish to go on with their previous lives, the usual and normal life, as it was lived before. For these participants continuity also involved the idea of themselves being the same person as before. Participants expressed this desire and expected to bounce back into that former life, with all the capabilities they had before. A certain degree of denial of the consequences of one's illness may be heard in this need.

One participant assumed that he could take up his usual family tasks after a short period of recuperation.

> *'I am the cook in the family. For now they have to do the cooking themselves and I hear them about ordering pizza's! But they also tried to make a home-cooked meal, so I see some progress. Normally, I also do the cleaning in the house, seeing*

those tiles shining again makes me content. My wife cannot do these things.' [P12, interview with patient]

Another participant, who was readmitted multiple times, struggled with the notion that her life could not return to normal anymore. She lived with a husband diagnosed with Alzheimer's Disease. When asked about the upcoming hospital discharge she expressed grief, in that moment realizing that she was losing her life as it had always been. She also expressed frustration towards her husband and family for lack of understanding what she needed them to do. She felt that they were not offering help in the way she needed it to experience the usual way of things again.

'What do you need to recover at home?' 'Well, eh, that I don't have to do everything, [hesitates] because, you know, he is not going to do the shopping… Yes, imagine you come home from hospital and there is no food in the house, nothing…' [P1, interview with patient]

'You told me your children want to help you?' 'Yes, but they want to do the shopping all in once, during the weekend. I would want to get out of the house regularly. Take a walk and have them do what needs to be done.' [P1, interview with patient]

This participant did not succeed in compromising between available help and her own need for continuity. She could not find a match with the available help and left the hospital without arrangements for care.

5. Relief

In the participants' considerations on discharge and follow-up care another underlying need was expressed as well: a deeply felt longing that all medical treatment would come to an end. This resulted in a dismissive or downright negative attitude towards any form of follow-up care including rehabilitation. Participants driven by this need made it clear, in word and gesture, that it has been enough, that they wanted no treatment anymore.

One participant had a history of cancer treatment and was now diagnosed with a malignant tumor again. During his long post-operative trajectory with grave complications, he grew passive, silent and repellent towards further treatment of any kind.

'I want no treatment anymore.' [P11, observation bedside conversation]

'It is unbearable, I never wanted this. My situation really is hopeless. Now they even gave me oxygen, I never had that before'. [P11, interview with patient]

> *'Beforehand he had refused surgery, but since his physical performance was really good they could operate on him and he then complied. Since than he has expressed several times that all this is too much for him.' [P11, consultant report]*

Another participant with a long medical history, mobility impairments and chronic pain initially refused all medical treatment after an acute readmission from home.

> *'What would be her own wish?' 'She herself wants nothing'. 'Nothing?' 'She really wants nothing. She wants to smoke, she wants no fussing, no hassle, nothing'. [P5, conversation with physician]*

Her family, who felt differently, succeeded in convincing her step by step to accept and comply to treatment and to a transfer to geriatric rehabilitation.

Discussion

To gain a comprehensive understanding of older surgical patients' preferences for follow-up care this study explored the wishes, uncertainties and concerns regarding follow-up care that these patients expressed throughout the process of discharge planning. From their considerations, including those indirectly voiced through family members or professionals, we were able to identify five underlying needs: safety (adequate care), familiarity (trusted people and surrounding), independence (active and autonomous living), continuity (resume previous life), and relief (ending endurance). Most participants expressed more than one need in their considerations.

The underlying needs we identified may elucidate patients' preferences for follow-up care. For instance, a strong rejection of inpatient follow-up care may reflect a significant need for familiarity for one patient, while the same rejection may be driven by an underlying need for independence for another. Similarly, a need for independence may also motivate a patient's preference for a rehabilitation trajectory. As such, the associations between needs and preferences are not universal. However, gaining insight in the underlying needs of patients may enhance understanding of their individual preferences for follow-up care.

All participants had recently undergone major surgery. Consequently, when considering hospital discharge, an important need was to feel safe and be strong enough to leave the hospital. Regarding this need for safety there appears to be no difference between the patient's perspective and the medical perspective. Patients as well as caretakers were concerned about wound healing, infections, and other potential urgent problems. Therefore, the patients' considerations regarding safety seem to align with the medical discourse on 'readiness for discharge after colorectal surgery', which includes guidelines concerning pain management, oral intake, lower bowel functioning and absence of complications (Fiore et al., 2012; Kelly et al., 2016). However, this does not exclude the

possibility of differing opinions regarding the safety of an individual patient. In our study, we observed patients who were more anxious about their recovery than the professionals deemed necessary. This finding supports Hyslops recommendation to use the patients' own perspective on risks as a starting point to reach person-centred decisions (Hyslop, 2020).

The need familiarity often underlies a strong preference to return to family and loved ones. This preference may be attributed not only to a strong bond with home but also to the significant difference between the hospital setting and one's own home. In an interview study on the complex care transitions of colorectal patients the 'wish to return home' was identified as one of the overarching themes as well (González et al., 2017). According to the authors, dissatisfaction and tensions concerning hospital stay were strongly related to the contrasts patients experience between the hospital with its strict system of procedures and medical rules and the familiarness of their own home. In our study, however, we also observed a patient (P4) who, after a lengthy hospital stay, had developed a strong attachment to the staff and routines of the ward, and therefore did not want to move to a different setting. The need for familiarity could thus manifest as a form of hospitalization as well, wherein the contrast between life in the hospital and the outside world is fading.

For older hospital patients arrangements of follow-up care after discharge may imply a transition to care dependency. The underlying needs for independence and continuity seem to most accurately reflect the patient's concerns about this issue. The need for independence for instance could be an expression of a deeply felt desire to be active, to be up and about, and a corresponding strong rejection of nursing home care, as we saw in one of our participants (P10). As such, independence includes what elsewhere is described as the need to be one's own master, signifying a want for autonomy, self-rule and freedom that transcends physical independence as a need (Salisbury, 2019). In the need for continuity, there may even be a certain degree of denial of the consequences of one's illness. In our study, some participants expected to bounce back into one's former life, with all the capabilities they had before. They appeared to accept only follow-up care that could help achieve this goal. Consequently, a significant discrepancy between the patient's and the professional's perspectives can emerge in discussions about the need for independence and continuity. In one of such cases the patient was discharged without any arrangements being made; none of the proposed options provided the desired continuity (P1).

Relief, the strong wish that all medical treatment would come to an end, is yet another underlying need that implies a rejection of follow-up care. Simultaneously, there appears to be more at stake, as this need for relief of the burden of all medical care may imply that the patient is accepting the end of his life. This may explain that, despite our finding of these wishes being noted in reports, it seemed difficult for doctors and family members

to address them. The patients in our study were persuaded to rather take a next step in their treatment and care process. These observations align with the reluctant acceptance of transition to follow-up care, found in a study on patient and caregiver experiences with delayed discharge from a hospital setting (Everall et al., 2019).

Based on a multinational study of a similar population, adult patients who had undergone abdominal surgery, it appears that no needs were overlooked. Their answers to 'what recovery essentially meant to them' can be easily linked to the needs found in our study: 'resolution of symptoms' (corresponding to the need for safety), 'returning to habits and routines' (corresponding to the need for continuity) and 'regaining independence' (corresponding to the need for independence) (Rajabiyazdi et al., 2021). Since the participants of this study had already been discharged home, the need for familiarity, as found in our study, was no longer a concern for them.

All five underlying needs were identified partly through notes in the medical records, primarily reports of nurses and consultants, as indicated by their quotes in the results section. This demonstrates that conversations with older surgical patients regarding discharge and follow-up care did certainly take place and extended beyond the practical questions of 'who, what, where, and when'. However, these conversations were held rather casually and their reports were scattered throughout the medical record. To get a more comprehensive picture of older surgical patients' needs concerning follow-up care, the concepts of safety, familiarity, independence, continuity and relief that were identified in this study may be helpful. They might be used as a framework to listen to patients' underlying needs and to invite them to discuss potential needs that they do not bring up on their own initiative. In doing so all team members could report their observations and interpretations of patients' preferences in a more systematic way. To amplify the older patient's voice amidst 'the noise' of a hospital ward, a team approach is therefore needed.

This study was conducted in a surgical department for patients with colorectal or inflammatory bowel disease or with neuro-endocrine oncological disease. As expected this ward generated rich data about the patients' perspective on follow-up care. The patients were not only referred to geriatric rehabilitation, an obvious discharge destination in trauma, orthopedic or neurological wards, but also to specialized homecare, other inpatient supportive care and even palliative care. As a result, we were able to identify a relatively broad range of underlying needs with a relatively small number of participants. We therefore find it plausible that the predominantly abdominal surgical patients in our study are representative of the broader population of older surgical patients.

However, as our study focused on older surgical patients, it is important to recognize that the identified needs may not be fully transferable to older hospital patients in general. For example, the specific care needs related to wound healing, bowel functioning, and nutrition in our population may have contributed to the surgical-specific underlying

need 'safety.' Nevertheless, safety - particularly in terms of the prompt availability of care - may still be a relevant factor in discharge conversations for other older patients. Conversely, research on different subpopulations may reveal needs that are less relevant for surgical patients. Therefore, future research is needed to assess whether our findings are transferable to other subgroups of older hospital patients, such as those with trauma or neurological conditions.

A major strength of this study is that the research was conducted prospectively and on location. Data were collected 'in the moment' of the decision making process and without intervening in the 'real world character' of the surgical ward. The topics discussed in the interviews were specific and realistic as patients were waiting for hospital discharge. Furthermore, the different methods of data collection allowed for capturing a comprehensive range of patients' considerations throughout the discharge planning process, including those expressed when the researcher was not present.

However, we encountered limitations as well. Observation of bed-site visits were limited due to a combination of unplannable workflow on the ward and limited availability of the researcher. As a result, data collection gradually shifted from observational methods to interviews and informal conversations with patients and staff. More observations of bed-side conversations on discharge and transitional care might have shed more light on the arguments that patients, families and clinicians exchange in discussing and planning follow-up care.

Secondly, the patients that participated were recovering from recent major surgery and had limited energy for in-depth interviews. The duration of the interviews was adapted to their condition and interviews were bedside held. Sometimes other patients were present in the room. Although these circumstances reflected the real world character of a surgical ward, they felt suboptimal from the researcher's point of view. However, it did not seem to withhold participants from openness and straightforwardness, resulting in a rich supply of data.

Conclusion

To improve transitional care decisions for older hospital patients, it is important to understand the needs underlying their preferences. In this study, we identified safety, familiarity, independence, continuity and relief as key needs for older surgical patients. These concepts might be used as a framework to help nurses, physicians and therapists to gain a more comprehensive understanding of their considerations regarding discharge and follow-up care. While other subgroups of older hospital patients may have different needs, the principle of exploring these underlying needs may be applied universally across all older hospital patient populations. We therefore recommend further exploration of needs as an important step toward personalized decision-making in transitional care of older hospital patients.

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Supplemental Files

Supplemental files A. Topic list of patient interviews

1. Introduction
How are you today?
Please tell me about your situation at home. (What kind of house do you live in? Who do you live with?)

2. Hospital stay
Why were you admitted to hospital?
When was this?
Can you tell me what happened since?

3. Discharge
Has discharge from hospital been discussed with you? In what way? Who spoke with you about this? When was this?
Are you ready to leave hospital?
Do you want to go directly home or do you prefer to go to a nursing facility to recover. (Can you tell me some more about that? What do you expect about your recovery?)
Did you speak about discharge from hospital with your family? (coming home or going to a facility?) What did they say about it?
What did the team tell you about hospital discharge? What did they think about your view? (Could you tell them what you want?)
How do you think you will feel the days and weeks after leaving the hospital? What do you look forward to, what do you worry about? How will you deal with this?
When date of discharge and discharge destination are decided: What do you think of the arrangements that are made?

4. Review
Is there anything else you would like to add? About your discharge and the follow-up care arrangements or how they were made? Or about this interview?

Supplemental files B. Overview of data collection in each case

	Interview with participant	Informal conversation with family member	Informal conversation with professional[1]	Observation bedside visit[2]	Observation medical rounds[2]	Report in medical record[3]
P1	x		x	x		x
P2	x					x
P3	x			x	x	x
P4	x	x	x			x
P5	x		x		x	x
P6	x				x	x
P7	x					x
P8	x		x		x	x
P9	x	x				
P10	x				x	
P11	x	x				x
P12	x				x	x

1. Nurse, physician, allied health professional. 2. Nurse, physician. 3. Nurse, physician, allied healthcare professional, medical consultant

Supplemental files C.

Two examples of a case-specific memo:

P3: The patient is naturally strong and optimistic, but now desires a period of recovery. She had the option to either go home or stay temporarily at [nursing home in her neighbourhood], and chose the latter. A significant factor in her decision seems to be the need for regular changes of the VAC pump. ("She also wonders if she might prefer to go home, but the VAC pump, which needs to be changed every three days and is very painful, makes her prefer to stay a little longer for care.") It is also possible that her (foster) son's reluctance for her to go home influenced her choice.

P8: The patient is very tired and dreads being alone at night if she were to go directly home with home care. She recalls a similar situation 11 years ago. She attributes her fatigue to multiple factors (long waiting times for surgery, having been operated on twice, and being 10 years older). It was later discovered that her haemoglobin was so low that she required a blood transfusion. This does not mean, however, that she is eager to go to a nursing home. She fears that the care there might not be adequate. However, going home with home care is not something she can manage, no matter how much she would like to (even though she wants to take care of the dogs).

Codes, themes and main themes emerging from the individual case histories

Codes	Themes	Main themes
Nursing facility for vacuum assisted treatment (VAC) Knowing what to expect after discharge Start training Go home when medical treatment is clear. Improving one's condition Go home when it is safe Go home after recovery care (in a facility) Not yet thinking about going home Worried about wound care in nursing facility Nursing home for physiotherapy and diet Family agrees with need for nursing home stay.	Health	1. Safety
Not go back to nursing home care Trusting nursing home care Worried about outpatient treatment Anxious about new setting Anxious to be alone at night Can't go home yet Worried about nursing home care	Security	
Building up slowly Anxious and uneasy about recovery Afraid to start training Uneasy to move forward in recovery process Going home is too early Not being brave now	Prudence	
Preferring a care facility in the neighborhood Homesick With my family I can manage. Trust in support of my own family	Familiarity	2. Familiarity
To be on my own again. The urge to be out of the hospital To live independently with my partner Not becoming old and in need of help Rather be dead than in a nursing home Uneasy about slow recovery Want to be out of the hospital Push through to recover	Independence/ freedom	3. Independence

Codes	Themes	Main themes
I want to be back in my old life Healthy and taking care of myself again. Anxious about partner with dementia Longing for lost capacities Not wanting to go to a nursing home	Continuity	4. Continuity
Worried that partner/family must handle too much Worried about pets Anticipating return home Regaining strength and abilities Family can't do without me	Responsability	
Sudden transfer to rehabilitation facility Complying to be transferred to a nursing home Rehabilitation is unknown to us.	Compliance	5. Relief
It has been enough now I am done with it	Burden of treatment	

CHAPTER 3

REFERRAL TO GERIATRIC REHABILITATION: A SCOPING REVIEW OF TRIAGE FACTORS IN ACUTELY HOSPITALIZED OLDER PATIENTS

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Age and Ageing. 2022

ABSTRACT

Objective

Old or frail acutely hospitalized patients can benefit from geriatric rehabilitation but criteria concerning referral decisions are unclear. This review presents an overview of clinical factors associated with referral to geriatric rehabilitation that may further consensus between hospital and rehabilitation professionals on triage.

Design

Scoping review.

Methods

A review was conducted following Arksey and O'Malley's framework. The search included literature concerning a broad spectrum of acutely hospitalized patients and factors associated with their referral to geriatric rehabilitation.

Results

Selected abstracts were categorized into distinct geriatric rehabilitation care pathways like stroke, hip fracture, amputation of lower limb, cardiac and oncologic rehabilitation. Abstracts on internal medical patients were further reviewed and 29 studies were included. 13 studies focused on factors identifying rehabilitation needs and 16 on factors associated with outcome of geriatric rehabilitation. Triage factors were diverse and included frailty status, functional decline, cognitive symptoms and multimorbidity. Mood symptoms and living situation further specified post-acute care needs. In overview, triage factors could be characterized as demographic (n=4), diagnosis-related (n=8), mental (n=6), functional (n=10) or multi-domain (n=12) and mapped in a transitional care pathway.

Conclusions and implications

Frailty and functional decline are characteristics, frequently associated with referral to geriatric rehabilitation of acutely hospitalized internal medical patients. A comprehensive geriatric assessment or a simpler multi-domain set of tests reveals rehabilitation needs and approximates a functional prognosis. Professional consensus on factors and timing of triage in hospital is within reach.

Introduction

Geriatric rehabilitation (GR) is post-acute restorative care that is adapted to older or frail hospitalized patients, especially those with pre-existing functional decline or specific care needs (Bachmann et al., 2010; Hoenig et al., 1997; Achterberg et al., 2019). Its central goal is to optimize functional capacities and support societal participation despite impairments (Grund et al., 2020). Old or frail patients with stroke, fractures, amputation, or undergoing orthopedic surgery can profit from this kind of post-acute care. Patients who are hospitalized with acute internal illnesses like infections, organ failure or exacerbations of chronic diseases can benefit from rehabilitation as well (Grund et al., 2020; Everink et al., 2016; Bouwstra et al., 2017; Boston Working Group, 1997). Since acute hospitalization of older patients is often associated with functional decline, geriatric rehabilitative care has become an important post-acute care pathway enabling patients to continue living at home (Covinsky et al., 2003; Buurman et al., 2011). It is either a home-based service offered by community care organizations or an inpatient care trajectory in geriatric hospitals, geriatric wards, rehabilitation hospitals, skilled nursing facilities or nursing homes with rehabilitation units (Grund et al., 2020).

Accurate identification of patients for rehabilitative care is pivotal to optimize targeting of care and prevent unnecessary transitions. In the triage process a patient's care needs, his functional prognosis and personal wishes should serve as building blocks for the decision making (Tanaka et al., 2008; Goncalves-Bradley et al., 2016; Burke et al., 2017). Triage for rehabilitative care assumes a multifaceted, patient-oriented examination and evaluation of all relevant factors to establish the rehabilitation potential (Tanaka et al., 2008; Jesus et al., 2015; Kennedy et al., 2012). The assessment of a patient's rehabilitation prognosis, however, is predominantly based on clinical intuition. A strong evidence base for the clinical factors that contribute to post-acute care decision making is absent (Hoenig et al., 2004; Gijzel et al, 2019).

Apart from clinical factors, organizational aspects play an important role in referral practice (Buntin, 2007; Ayele et al., 2019). Pressure to discharge early is a key driver for hospital referral practice (Poulos et al., 2007). Other non-clinical factors in referral procedures are the capacity of local facilities and their distance from the patient's home (Buntin et al.,2005). Healthcare regulations and insurance policy may represent limitations for rehabilitation facility placement (Bouwstra et al., 2017; Buntin et al., 2009).

In the absence of consensus on clinical criteria for rehabilitation needs and potential of old or frail acutely hospitalized patients we undertook a scoping review of the literature on geriatric rehabilitation triage decisions. Scoping reviews are a form of knowledge synthesis that addresses broad or fragmented areas of research, aiming to map the literature on a practice that is less studied or understood in literature (Levac et al., 2010). The purpose of this review is to present an overview of factors considered relevant to

assess the eligibility of hospital patients for geriatric rehabilitation in order to advance professional consensus concerning triage.

Methods

We followed the framework for scoping reviews by Arksey and O'Malley and refined by Levac, starting with a broad definition of the study population (Levac et al., 2010; Arksey and O'Malley, 2005; Daudt et al., 2013).

The research team consisted of elderly care physicians, an internal medical resident, geriatric rehabilitation specialists and researchers. The core elements of the search string (Appendix B) were key words associated with 'geriatric patients', 'rehabilitation', 'referral/triage' and 'in-hospital'. Growing numbers of patients have received geriatric rehabilitation care since 2000, we therefore limited our search to articles published between January 2000 and July 2020. We included English, French or German articles extracted from PubMed, Embase, CINAHL, PsycINFO and the Cochrane Library. Our protocol is in Appendix A.

Selection of abstracts

A priori in- and exclusion criteria were set. Two reviewers (AG, EW) independently screened the abstracts. A third member of the scoping team (RB) was consulted when consensus about selection was not reached.

We included studies

- on referral to rehabilitative post-acute care of vulnerable, community dwelling, acutely hospitalized older patients
- on prognostic factors influencing functional recovery in acutely hospitalized old or vulnerable community dwelling persons.
- targeting rehabilitative post-acute care referral and involving family caregivers or professionals.
- on interventions concerning selection for geriatric rehabilitation.

We excluded studies

- reporting exclusively on prevention of adverse outcomes in frail older hospital patients.
- involving hospitalized long term care patients.
- on efficacy of a specific geriatric rehabilitation intervention.
- focusing only on burden of family caregivers.

Narrowing down and re-evaluation.
Categories of abstracts were formed according to the main hospital diagnosis of the study population and the associated rehabilitative care pathway. For the remaining abstracts three overarching categories were formed: triage education of hospital staff, organization of the referral process and health economic aspects of access to geriatric rehabilitation. Confronted with an overwhelming amount of data after this first phase of the selection procedure, the second phase of selection exclusively focused on internal medical patients. This inclusion criterion was added. The research team assumed that literature concerning this heterogeneous group of rehabilitation candidates would present rich data on triage factors. Referral decisions concerning patients with classic rehabilitation diagnoses like stroke or hip-fracture might be more routine.

Two researchers (AG,CD) re-evaluated the selection of abstracts in the internal medical category to assess their fit with the purpose of our research: an inventory of patient related factors concerning referral to geriatric rehabilitation. They continued with the selection for full text evaluation. All through the selection phases arguments to amend in- and exclusion criteria were discussed.

Charting of data
Included studies were scrutinized to extract data about aims, design and findings. and papers were categorized according to their focus, whether on rehabilitation needs or on potential to recover. Triage factors were extracted, categorized and presented. Appendix C shows the framework for scoping reviews.

Results

The literature search resulted in a total of 1,245 abstracts, which were assigned to diagnostic categories associated with rehabilitation care pathways. Reports on stroke patients represented the largest group followed by patients with internal medical diagnoses like infections, organ failure, malnutrition, deconditioning, ulcers or a deterioration of chronic illness. This category of abstracts was further reviewed. Other categories concerned cardiac rehabilitation patients, patients with hip-fracture, other trauma, amputation, elective orthopedic surgery and patients with delirium, dementia or psychiatric diagnoses. Figure 1 shows the flow diagram of the selection process.

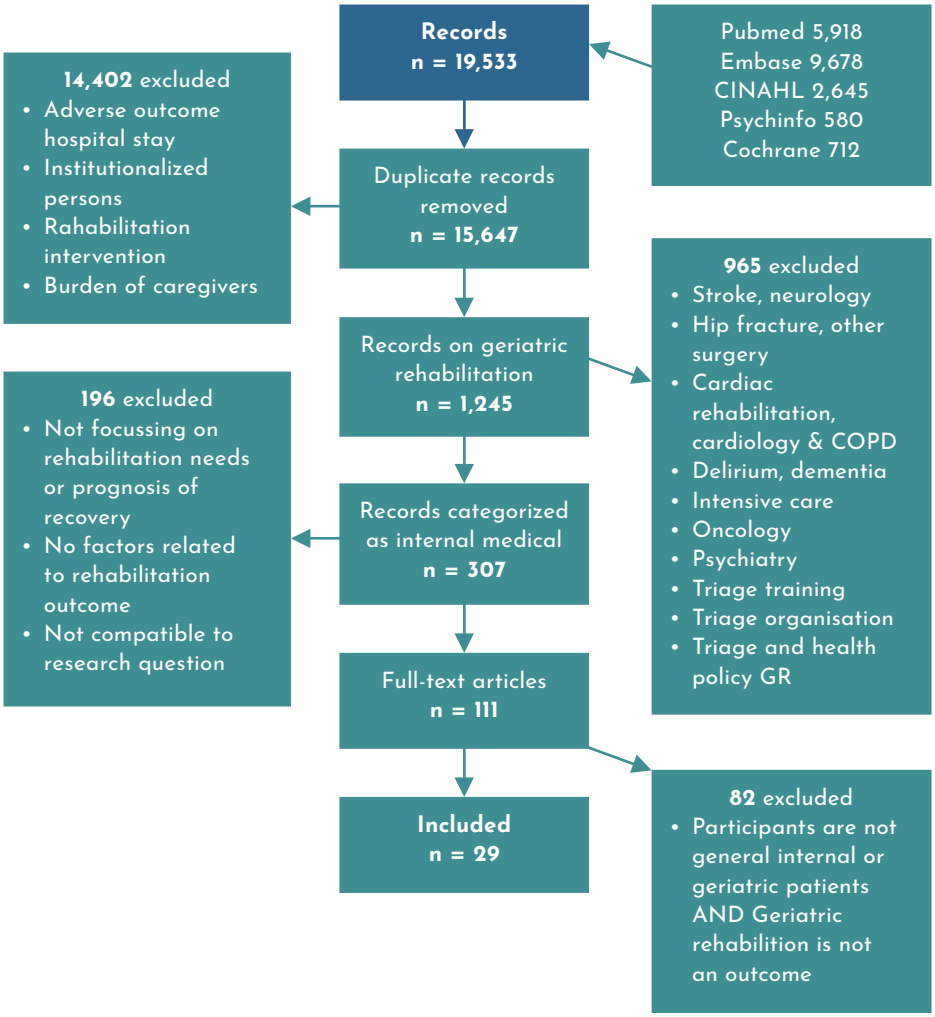

Figure 1. Flow chart of the scoping review process

Included studies

Design

We found 29 studies on factors related to recovery of internal medical patients; 19 of these were prospective cohort studies (Leung et al., 2016; Abrahamsen et al., 2016; Gijzel et al., 2020; Peel et al., 2014; Abrahamsen et al., 2016; Boyd et al., 2008; Buurman et al., 2016; Cullum et al., 2008; Koch et al., 2019; Luthy et al., 2007; Jackson et al., 2016; D'Souza et al., 2021; Meyer et al., 2019; Gill et al., 2009; Wakabayashi et al., 2014; Hubbard et al., 2011; Luk et al., 2011; Singh et al., 2012; Arjunan et al., 2019; Garner et al.,2019), 8 retrospective (Kortebein et al., 2008; Hartley et al., 2017; Liu et al., 2016; Hartley et al., 2017; Lyons et al., 2019; Gill et al., 2009; Ling et al., 2018; Simning et al., 2018; Luk et al., 2011) and 2 used mixed methods, combining a cohort study with interviews or a survey Bowles et al., 2009; Koné et al., 2018). The sample size varied from 100 (Leung et al., 2016) to over 60,000 Kortebein et al., 2008). Duration of follow up was three months (Abrahamsen et al., 2016; Gijzel et al., 2020), six months (Peel et al., 2014; Abrahamsen et al., 2016) or one year after discharge (Boyd et al., 2008; Buurman et al., 2016).

Settings and participants

Eleven studies were situated in acute hospital wards and included only internal medical or acute geriatric hospital patients Gijzel et al., 2020; Boyd et al., 2008; Cullum et al., 2008; Koch et al., 2019; Luthy et al., 2007; Hartley et al., 2017; D'Souza et al., 2021; Liu et al., 2016; Meyer et al., 2019; Hartley et al., 2017; Lyons et al., 2019), another four also included other acute hospital patients (Bowles et al., 2009; Peel et al., 2014; Cullum et al., 2008; Koch et al., 2019). Fourteen studies were situated in rehabilitation settings: one outpatient rehabilitation setting (Peel et al., 2014), the other 13 were situated in intermediate care units in skilled nursing facilities, rehabilitation hospitals or geriatric rehabilitation hospital wards (Leung et al., 2016; Kortebein et al., 2008; Abrahamsen et al., 2016; Abrahamsen et al., 2016; Gill et al., 2009; Ling et al., 2018; Simning et al., 2018; Wakabayashi et al., 2014; Hubbard et al., 2011; Luk et al., 2011; Singh et al., 2012; Arjunan et al.,2019; Jupp et al., 2011).

Outcome

Primary outcome of the hospital studies was discharge disposition: discharge home versus non-home or transition to geriatric rehabilitation. In geriatric rehabilitation settings the primary outcome was discharge to independent living versus long term care. In our selection two studies fitted best to our research purpose, focusing exclusively on referral of internal medical patients to geriatric rehabilitation (Luthy et al., 2007; Hartley et al., 2017). An overview of participants, settings and primary outcome is in Table 1.

Table 1. Participants and outcome in selected studies

Transition			
Participants	**Hospital to geriatric rehabilitation**	**Hospital to post-acute care**	**Rehabilitation or post-acute care to home**
Internal medical patients	Luthy, Meyer	Boyd, Cullum, D'Souza, Koch, Liu	
Acute geriatric patients	Hartley	Gijzel, Hartley, Lyons	
Acute hospital patients	Buurman, Koné	Bowles, Jackson	
Medical geriatric rehabilitation patients			Hubbard, Kortebein, Luk, Singh, Wakabayashi
Geriatric rehabilitation patients			Abrahamsen, Abrahamsen, Arjunan, Gill, Jupp, Leung, Ling, Simning, Peel

Acute geriatric patients: patients admitted to Department of Medicine for the Elderly wards or to geriatric wards. Medical geriatric rehabilitation patients: patients with neurological or internal, non-surgical, rehabilitation diagnoses.

Focus of studies

Rehabilitation needs

Triage factors associated with rehabilitation needs were evaluated in 13 studies (Bowles et al., 2009; Koné et al., 2018; Leung et al., 2016; Cullum et al., 2008; Koch et al., 2019; Luthy et al., 2017; Hartley et al., 2017; Jackson et al., 2016; D'Souza et al., 2021; Liu et al., 2016; Meyer et al., 2019; Hartley et al., 2017; Lyons et al., 2019). These papers described patient characteristics and symptoms indicative of the necessity of post-acute care. ADL dependency and cognitive decline were factors frequently associated with referral to rehabilitation (Leung et al., 2016; Koch et al., 2019; Hartley et al., 2017; Jackson et al., 2016; D'Souza et al., 2021; Liu et al., 2016; Meyer et al., 2019; Hartley et al., 2017; Lyons et al., 2019. Other examples of this type of triage factors were living without help at their own home, having a less than excellent self-rated health, symptoms of depression, multi-morbidity, case complexity and length of hospital stay. Multi-domain triage tools assessing rehabilitation needs were the Hospital Admission Risk Profile, the INTERMED score and the Post-Acute Care Discharge score (Koch et al., 2019; Luthy et al., 2007; Liu et al., 2016.

Rehabilitation outcome

The focus of the other 16 studies was to examine patient factors predicting rehabilitation outcome (Kortebein et al., 2008; Abrahamsen et al., 2016; Gijzel et al., 2020; Peel et al., 2014; Abrahamsen et al., 2016; Boyd et al., 2008; Buurman et al., 2016; Gill

et al., 2009; Ling et al., 2018; Jupp et al., 2011; Simning et al., 2018; Wakabayashi et al., 2014; Hubbard et al., 2011; Luk et al., 2011; Singh et al., 2012; Arjunan et al., 2019). Outcome was measured as duration of rehabilitation, functional gain or discharge destination. Pre-existing loss of instrumental ADL adversely affected functional gain during rehabilitation (Kortebein et al., 2008; Abrahamsen et al., 2016; Cullum et al., 2008; Jackson et al., 2016; Gill et al., 2009; Wakabayashi et al., 2014; Hubbard et al., 2011; Luk et al., 2011). Rehabilitation outcome was negatively associated with duration of the trajectory of functional loss before the acute illness and with the presence of mobility problems at admission (Boyd et al., 2008; Buurman et al., 2016; Gill et al., 2009). The relation between severity of frailty and low functional gain during rehabilitation was reported in four studies (Hartley et al., 2017; Gill et al., 2009; Singh et al.,2012; Arjunan et al.,2019). In a severely frail cohort, daily use of a measurement instrument for mobility and balance improved the prediction on discharge destination (Hubbard et al., 2011). In-hospital deconditioning was associated with poor rehabilitation outcome when the patient was also malnourished (Ling et al., 2018). Furthermore, oncologic or cardiovascular comorbidity reduced the outcome of geriatric rehabilitation (Bowles et al., 2009; Abrahamsen et al., 2016; Boyd et al., 2008).

Table 2 presents an overview of the triage factors in our selection.

Table 2. Characteristics, symptoms and measures associated with referral to geriatric rehabilitation

Demographic	Diagnoses, syndromes	Cognitive and mental status	Mobility and Functional status	Multi-domain tools and measures
Age[Boyd, Koch, Liu, Singh]	Admission diagnosis[Abrahamsen]	*Clock in the Box*[Jackson]	**Mobility**	**Frailty**
Sex[Koné, Luk, Singh]	Non-surgical rehabilitation diagnosis[Simning]	MMSE[Liu]	Gait speed[Peel, Arjunan]	Frailty Index[Singh, Arjunan]
Living without or with intermittent help[Bowles, Luthy]	*Multimorbidity*[Bowles, Luthy]	Cognitive impairment[Hartley, Lyons]	Qualitative gait[Arjunan]	Frailty Index-CGA[Hubbard]
Education [Jackson, Gill]	Metastatic cancer or cardiovascular disease as comorbidity[Boyd]	*Depressive symptoms*[Bowles, Cullum]	Physical activity[Gijzel]	Clinical Frailty Scale[Hartley, Hartley, Lyons]
	Dementia[Boyd]	Use of sedative medicine[Jupp]	Balance[Bowles, Hubbard]	**Comprehensive Geriatric Assessment**
	Vision impairment[Jupp]	Momentary well-being[Gijzel]	Hierarchal Assessment of Balance and Mobility (HABAM)[Arjunan]	Comprehensive Geriatric Assessment (CGA)[Abrahamsen, Gill]
	Low albumin[Boyd]		Elderly Mobility Scale[Lyons]	CGA Multidimensional Prognostic Index[Meyer]
	Malnutrition, sarcopenia, in hospital deconditioning[Koné, Kortebein, Buurman, Luthy, Wakabayashi]		De Morton Mobility Index, toilet transfer[D'Souza]	**Multi-domain tools**
			Functional status	*Case complexity, amount of nursing care (INTERMED)*[Luthy]
			Functional decline (ADL or I-ADL)[Boyd, Hartley, Liu, Simning, Wakabayashi]	*Active medical problems, living with help at home, number of disabilities, age (Post-acute care discharge score, PACD)*[Koch]
			BI-decline 2 weeks before hospital admission, decline of Basic ADL[Buurman, *Premorbid activity limitation*[D'Souza, Ling]	Gait, Eyesight, Mental state, Sedation (GEMS)[Jupp]
				Age, I-ADL, MMSE, Hospital Admission Risk Profile score (HARP)[Liu]
			Functional Independence Measure[Leung, D'Souza]	**Multi-domain measures**
				Less than excellent self-rated health[Bowles]
				Resilience[Gijzel]
				Length of Hospital Stay[Bowles, Koné, Luthy]

First author names are given in superscript.
In italics: factors identifying rehabilitation needs. ADL= Activities of Daily Living. I-ADL=instrumental Activities of Daily Living. BI=Barthel Index. CGA=Comprehensive geriatric Assessment. MMSE=Mini Mental State Examination.
INTERMED is a system for classifying case complexity.

Figure 2 presents an overview of triage factors and the care pathway prior to GR admission. It visualizes when triage information was assessed in the included studies.

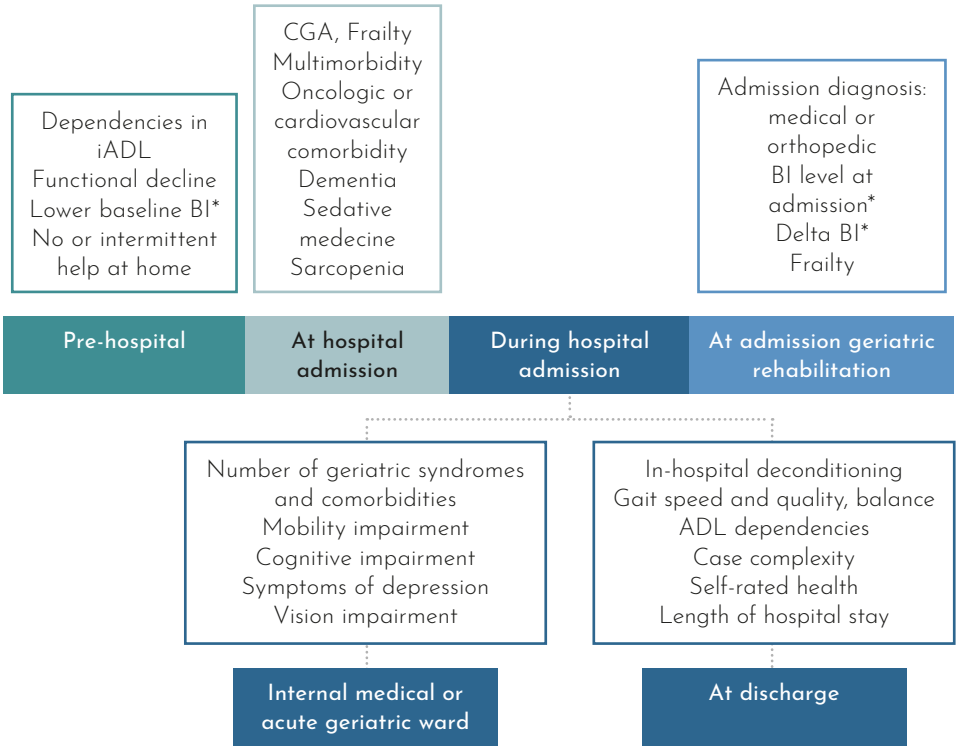

Figure 2. Triage factors visualized in a care trajectory
*ADL: Activities of Daily Living, iADL: instrumental ADL. BI: Barthel Index. CGA: Comprehensive Geriatric Assessment. Delta BI: BI at admission minus baseline BA. * BI or alternative functional measures. Multi-domain tools HABAM, GEMS, HARP, PACD are not included in this image.*

Multi-domain measurements

Instruments measuring multiple domains of functioning supported triage and discharge planning in five of the included studies. The HARP-score, consisting of age, cognitive status and I-ADL two weeks before admission identified individuals at risk of hospital related functional decline and predicted risk of facility-placement (Liu et al., 2016). In Luthy's study case complexity and nursing workload was taken into account, next to biomedical and psychosocial case-complexity (Luthy et al., 2007). More recently the Post-acute Care Discharge score and the Selfcare Index (SPI) were developed, two complementary and more elaborate triage instruments (Koch et al., 2019; Meyer et al., 2019). A study on resilience concluded that frequent assessments of both physical and psychological indicators supported prediction of recovery of geriatric patients by clinicians (Gijzel et al., 2020). Table 3 shows additional information on the selected studies.

Table 3. Characteristics of selected studies

Author and year	Subject and hypothesis	Population and setting	Exclusion	Triage factors
Bowles 2009.	Expert knowledge of important factors in post-acute care (PAC) referral, identification of characteristics hospitalized patients needing PAC	≥65 years Six hospitals, urban, suburban and rural	Not cognitively intact	Living without or with intermittent help, multimorbidity, depressive symptoms, balance, less than excellent self-rated health
Cullum 2008.	Relationship between depressive symptoms and hospital outcomes	≥65 years General hospital	Severe dysphasia, severe deafness, moderately impaired cognitive function.	Depressive symptoms.
D'Souza 2020	Association between patient factors and patients' discharge destination from acute medical wards.	Acute general medical patients admitted to physical therapy. Tertiary Hospital.	Palliative care patients or transferred from other units	Premorbid physical function, current functional status, mobility, toilet transfer.
Hartley, Adamson 2017	Association between Clinical Frailty Scale and functional trajectories.	≥75 years Acute patients first admitted to Dept of Medicine for the Elderly. Tertiary Hospital.	Patients outside hospital region.	Functional decline, frailty.
Hartley Alexander 2017	Compare functional trajectories of patients with and without cognitive impairment	≥75 years Acute patients first admitted to Dept of Medicine for the Elderly. Tertiary Hospital.	Patients outside hospital region. Palliative or terminally ill patients.	Cognitive impairment, frailty.
Jackson 2016.	Predictive validity for discharge location of the Clock in the Box at admission.	≥55 years Tertiary VA medical center	Detoxification or palliative admission, cognitive or sensory impairment, delirium	Cognitive screening.
Koch 2019	Predict post-acute care needs early after admission by combining a self-care index with PAC-Discharge score	≥16 years Acute medical or neurological patients. Tertiary hospital	Patients transferred from other hospital, from NH, terminally ill patients.	Self-care abilities, amount of nursing care, active medical diagnoses at admission, living with help at home, disabilities, age.
Koné 2018	Factors associated with transfer to transitional care or to geriatric rehabilitation	≥18 years Patients with care needs after hospital stay Municipal hospital		Sex, length of hospital stay.

Table 3. Continued

Author and year	Subject and hypothesis	Population and setting	Exclusion	Triage factors
Leung 2016	Characteristics and outcomes of elderly patients admitted to a slow stream, low-intensity and long-duration inpatient rehabilitation program	≥60 years Patients admitted to a 30-bed Slow Stream Rehabilitation Unit.	Medically unstable, palliative, undergoing chemotherapy or dialysis, wandering behavior.	Functional decline
Liu 2016.	Association of the Hospital admission risk profile (HARP) score with discharge to SNF or Acute Rehab Unit.	≥70 years Internal medicine inpatient unit Rural medical center		Age, cognitive status, instrumental ADL.
Luthy 2007.	Biomedical and psychosocial characteristics associated with PAC utilization.	≥18 years Internal medicine ward tertiary hospital; facility for rehabilitation and psycho-social care	Other diagnose than congestive heart failure, community acquired pneumonia, malaise or fall.	Psychosocial complexity, comorbidity, medical diagnoses.
Lyons 2019	Mobility trajectories and the associated patient characteristics (frailty and cognitive impairment)	Dept. of Medicine for the Elderly, first admittances Tertiary hospital		Cognitive impairment, mobility, frailty.
Meyer 2019	Predictive value of the Multidimensional Prognostic Index concerning nursing needs and discharge allocation.	>70 years Renal, rheumatoid, diabetic or internal medical patients with comorbidity Tertiary hospital	Inability to consent or to speak, terminal situation.	CGA, Multimorbidity, medication, pressure ulcer risk, nutrition, ADL and instrumental ADL, cognitive status, living situation.
Abrahamsen Haugland, Nilsen 2016.	Better post-acute care decision making. Potential predictors for not returning to own home after rehabilitation.	≥70 years Intermediate Care Unit with short-term rehabilitation	Major cognitive impairment, delirium. NH decides if suitable for Intermediate Care.	Functional decline before admission.
Abrahamsen Haugland, Ranhoff 2016.	Predictive value of admission diagnoses, degree of functional loss; simple versus comprehensive assessment.	≥70 years Intermediate Care Unit with short-term rehabilitation	Major cognitive impairment, delirium. NH decides if suitable for Intermediate Care.	CGA.
Arjunan 2019	Compare predictive value of Frailty Index and gait speed concerning geriatric rehabilitation outcome.	>65 years Inpatient rehabilitation ward Tertiary hospital.	Amputees	Gait, frailty.

Table 3. Continued

Author and year	Subject and hypothesis	Population and setting	Exclusion	Triage factors
Boyd 2008.	Functional outcomes in the year after discharge; identify predictors of failure to recovery to baseline function	≥70 years Tertiary care hospital, community teaching hospital	Hospital stay of less than two days, admission to Intensive Care Unit.	Age, co-morbidity, dementia, nutritional status
Buurman 2015.	Disability trajectories in the year before and after SNF admission, association with adverse outcome	≥ 70 years Community dwelling	Disabled in ADL at baseline.	Decline of basic ADL.
Gijzel 2020	Develop dynamical indicators of resilience	≥ 65 years Geriatric ward Tertiary hospital	LoHS<3 days, inability to respond, contact isolation.	Resilience, wellbeing.
Gill 2009.	Factors associated with recovery of prehospital function	≥70 years Community dwelling.	Disabled in ADL at baseline.	Mobility, nutritional status, cognitive status.
Hubbard 2011.	Bedside assessment of balance and mobility. Association of mobility and balance impairments to adverse outcomes.	≥65 years Tertiary care hospital		Mobility, balance
Jupp 2011.	Factors linked to discharge to residential placement after rehabilitation. Tool to guide rehabilitation requirements	≥65 years Two non-acute rehabilitation hospitals		Medication, vision, mental state, mobility.
Kortebein 2007.	Inpatient rehabilitation outcomes of older adults diagnosed with debility. *Hypothesis: functional improvement of patients with a primary diagnosis of debility is lower than in comorbid debility*	≥65 years 70% of rehabilitation facilities USA (IRF's)	Patients without a primary or comorbid deconditioning diagnosis.	Deconditioning.
Ling 2019	Association of premorbid activity limitation stages with post-hospital discharge disposition	≥65 years Medicare enrolees. All cause hospitalization		ADL and instrumental ADL.

Table 3. Continued

Author and year	Subject and hypothesis	Population and setting	Exclusion	Triage factors
Luk 2011.	Relationship between gender and rehabilitation outcome. Efficiency and efficacy of motor and functional outcomes. *Hypothesis: there are important gender differences in GR outcome.*	≥65 years Two Geriatric Units Geriatric medical care.	Not admitted from acute geriatric unit.	Sex.
Peel 2014.	Meaningful improvement in gait speed. Predictive properties gait speed at follow up.	Six sites of a community-based Transition Care Program. (TCP).		Mobility.
Singh 2012	Comparison of chronological age, gender, co-morbidities and frailty as predictors of adverse outcomes.	Acute geriatric medicine rehabilitation unit Tertiary care teaching hospital	Severe dementia, acute stroke, chronically bedbound.	Age, sex, frailty.
Simning 2019	Patient characteristics associated with patient-reported lack of functional improvement. *Hypothesis: demographic, socioeconomic, health status and rehabilitation characteristics are associated with patient reported outcome of rehabilitation.*	≥65 years National Health and Aging Trends Study of Medicare beneficiaries receiving rehabilitation services in 2015 and 2016		Functional decline.
Wakaba-yashi 2014	Association nutritional status and rehabilitation outcome in older inpatients with hospital-associated deconditioning. *Hypothesis: hospital-associated deconditioning is a result of inactivity and malnutrition.*	≥65 years Tertiary-care acute general hospital department of rehabilitation medicine	Not diagnosed with hospital-associated deconditioning.	Nutritional status.

ADL: Activity of Daily Living. IC: Intermediate Care. CGA: Comprehensive Geriatric Assessment. IRF: Inpatient Rehabilitation Facility. LoHS: Length of Hospital Stay. MDCC: Multi- Disciplinary Case Conference. NH: Nursing Home. PAC: Post-Acute Care. NH: Nursing Home. SNF: Skilled Nursing Facility. TCP: Transition Care Program. VA: Veteran's Affairs

Discussion

This review presents an overview and categorization of relevant triage factors. It shows that triage decisions are based on symptoms and measurements of frailty, functional decline, geriatric syndromes like cognitive impairment or deconditioning, and new or pre-existing care needs. Triage factors relate to rehabilitation needs and influence rehabilitation outcome. A minimal, multidisciplinary set of clinical data regarding the relevant domains, that is assembled as early as possible during hospital stay, can support identification of rehabilitation needs, as well as assessment of rehabilitation eligibility.

Triage support

Referral decision making is part of clinical routine, but professionals receive little training for this task (Garner et al., 2019; Muniak et al., 2019). To support triage decisions, use of multi-domain tools help to identify rehabilitation needs or predict rehabilitation outcome (Koch et al., 2019; Liu et al., 2016; Meyer et al., 2019; Jupp et al., 2011). These tools inform referral decision making by adding up criteria that are deemed relevant for triage. Although a comprehensive geriatric assessment (GCA) explores all relevant domains and facilitates a personalized care plan, a set of multi-domain tools assessing ADL function, frailty status, comorbidity and cognition may also give sufficient information regarding rehabilitation eligibility (Ling et al., 2018; Ellis et al., 2017; Pilotto et al., 2017; Parker et al., 2018). A potentially promising and evidence-based approach to support decision making is to use structured patient data for automated triage support (Bowles et al., 2009; Bowles et al., 2019). These alternative tools and methods would be less extensive than performing a CGA and they are applicable in settings where geriatric medical care is not available. Interpretation of clinical data concerning referral decision making, however, requires geriatric rehabilitation expertise. Evaluation of the patients' situation and the dialogue with patients and their family on preferred treatment remains essential despite availability of triage support.

Geriatric syndromes and rehabilitation eligibility

Frailty, cognitive decline, new ADL dependencies and deconditioning are geriatric syndromes that can indicate rehabilitation needs in older internal medical patients (Tanaka et al., 2008; Scharf et al., 2020; Cowley et al., 2021; Morandi et al., 2015). Especially when symptoms of depression or delirium co-exist, these syndromes give rise to rehabilitation needs. On the other hand, these clinical characteristics and their associated care needs represent factors that may influence the rehabilitation prognosis unfavorably (Cullum et al., 2008; Jackson et al., 2016; Hartley et al., 2017). Both frailty and cognitive impairment are related to negative health outcomes and diminished responsiveness to therapy (Dent et al., 2019; Vermeiren et al., 2016; Theou et al., 2018). Since geriatric rehabilitation wards strive to make specific care adjustments for these patients, mild or moderate cognitive decline need not be a criterion to exclude patients for rehabilitation oriented care (Leung et al., 2016). Establishing the potential of the individual to profit

from rehabilitation, is a complex clinical judgement that calls for geriatric assessment and careful multidisciplinary observation of frail or cognitively impaired patients (Cowley et al., 2021; Longley et al., 2018). When individual patient characteristics like mood, coping style, motivation and family support are taken into account, rehabilitation programs that address these personal resources can support patients despite frailty (De Donder et al., 2019; Puts et al., 2017; Arjunan et al., 2018). Programs with a lower intensity of treatment and longer duration, including outpatient treatment represent promising options for frail patients, despite the relation between severity of frailty and low functional gain (Achterberg et al., 2019; Cowley et al., 2021). The assessment of rehabilitation eligibility, in the presence of geriatric syndromes thus calls for a multi-faceted evaluation of triage factors, preferably a comprehensive geriatric assessment.

Strengths

Our review had several strengths. Firstly, the methodology of exploring literature without appraisal of the evidence allowed us to present a comprehensive overview of triage factors. Secondly, we focused on complex triage decisions: those concerning patients with internal medical diagnoses. In this domain, compared to orthopedic or neurological rehabilitation, evidence is scarce.

Our data synthesis led to a distinction between patient characteristics that indicate rehabilitation needs and those associated with outcome of rehabilitation. This distinction may be helpful in decision making and in developing a core-set.

Limitations

We described only triage factors concerning patients with internal medical diagnoses and these may be less applicable to patients with other diagnoses. Triage factors for the latter may have been missed. The assembling of triage factors for internal medical patients, however, provides the field with a starting point to reach consensus on a triage core-set. Essential diagnosis-specific triage elements of other patient groups can be added later. Furthermore, we refrained from reviewing the abstracts concerning professional triage training, organization of triage processes and health economic factors regarding triage. A thorough exploration of these 'non-clinical' triage aspects calls for a comprehensive literature search in other sources.

Finally, we discussed our findings only within the research team and decided to consult other professionals in a later stage as part of a broad consensus procedure.

Recommendations

Geriatric rehabilitation triage factors are routinely assembled clinical criteria, though measured with different instruments by different professionals. Use of a core-set triage will advance communication of relevant triage factors in patient hand-overs. It will also facilitate the reports on course and outcome of geriatric rehabilitation.

Therefore, hospital and geriatric rehabilitation experts should achieve (to reach) consensus on a feasible and well-defined subset of triage factors. This should include at least pre-existing and actual functional and cognitive status, severity of frailty and profile of psycho-social needs.

Both implementation of a triage core-set and feedback between settings on geriatric rehabilitation trajectories, will enhance the transparency and the quality of triage decisions.

Conclusions and implications

Triage factors concerning geriatric rehabilitation patients with internal medical diagnoses were measures of frailty, functional status, cognitive impairments and new or pre-existing care needs. They also referred to geriatric syndromes like in-hospital deconditioning and multimorbidity. Triage factors were assembled at various moments during hospital stay. A comprehensive geriatric assessment or a less extensive set of multi-domain tests including functional, cognitive and frailty status informs triage decisions and may contribute to awareness of rehabilitation needs earlier during hospital stay. Future steps should include consensus between hospital professionals and rehabilitation teams on a core-set of triage criteria, in order to support decision making.

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Supplemental Files

Appendix A. Protocol Scoping Review

Background
Triage in general refers to the process of determining the priority of treatment, based on the severity of a patients' condition.

In geriatric rehabilitation (GR), triage is the decision making about referral of vulnerable hospital patients to a geriatric rehabilitation ward or a skilled nursing facility. An assessment of post-acute care needs underlies these triage decisions. The assessment of a patients' care needs, his rehabilitation goals and rehabilitation potential support the advice on proper level and place of post-acute care.

The aim of this scoping review is to examine the breadth of literature on criteria and methods for this decision making about referral to geriatric rehabilitation. Although triage decisions are daily hospital routine, criteria for referral to geriatric rehabilitation are not clear. We are especially interested in research on the characteristics of geriatric and general internal patients that are deemed eligible for geriatric rehabilitation.

This scoping review is part of a research project on triage in Geriatric Rehabilitation.

Procedure
Research question
What are patient characteristics, criteria, tools or methods concerning referral to geriatric rehabilitation?

Search strategy
We will search PubMed, Embase, CINAHL, PsycINFO and the Cochrane Library. A search strings is developed based on the terms 'geriatric patients', 'rehabilitation', 'referral/ triage' and 'in-hospital'. (Appendix B)

Selection of studies
Two reviewers will independently screen abstracts using a set of inclusion- and exclusion criteria. They will discuss the selection of eligible abstracts, using the a priori criteria iteratively. A third member of the research team is consulted when consensus cannot be reached. Throughout the abstract selection process notes will be made to keep track of arguments for inclusion and exclusion.

Inclusion
Selection criteria on in- and exclusion were developed, defining the population of interest, the setting and the phenomenon triage, as well as the period and types of studies.

Articles in English, German or French.
Patient studies

- Concerning old or vulnerable hospital patients with impairments or geriatric syndromes.
- Studying prognostic factors concerning rehabilitation outcome or predictors for convalescence.
- Describing the method of enrollment in detail, if the research takes place in a geriatric rehabilitation setting

Research about caregivers of old or vulnerable persons, related to hospital discharge decision making.
Studies that enrolled professionals involved in triage.
Research that explored methods, models or criteria concerning referral to geriatric rehabilitation.

Exclusion

- Published before 2000.
- Research focusses primarily on prevention of hospital readmission in frail elderly.
- Research of patients from chronic care institutions.
- Studies on efficacy of specific rehabilitation interventions, not related to identification of GR candidates.
- Research focus is burden of caregivers.
- Long term survival is single outcome measure.

Abstracts into categories
The abstracts that are selected for eligibility of full text analysis will be grouped into categories, related to GR diagnoses and GR care pathways. Categories are: fracture of femoral neck; other traumatic injuries; orthopaedic joint replacement; amputation; COPD; post-ICU,; delirium and dementia; oncological; cardiovascular disease and cardiac rehabilitation; stroke and SAB; non-stroke neurology; psychiatric disorders and patients hospitalized with internal medical diagnosis comprising infections, organ failure, ulcers, deterioration of chronic diseases and other diagnoses.

The researchers will make three overarching and extra abstract categories for organisational, educative or health-economic papers. The abstracts in the overarching categories will be reviewed in a separate part of the project that will focus on non-clinical factors and methods of triage.

Exploring the abstracts in a second round
Since transition to orthopaedic or neurological geriatric rehabilitation programs are expected to be better implemented in the hospital routine, we will focus primarily on criteria explored in other categories of abstracts. In view of a presumably large quantity

of data, we will restrict the second phase of our scoping review to patients with internal medical diagnoses.

Teams of two researchers will re-evaluate the selected abstracts in a second round in order to analyse the eligibility of the article for full text analysis and its cohesion with the research question. They will reread the abstracts, checking for criteria like participants' age and clinical characteristics, design and setting of the research, focus and outcome, thus reinvestigating if it will provide data on triage. They will independently rank the abstracts with 0-2 points. When their ranking differs discussion follows and when no consensus is reached a third researcher will be consulted.

Ranking of researchers	Decision
0-0	exclude
0-1	exclude
1-1	discuss
2-0	discuss
2-1	include
2-2	include

During the process of re-examining the abstracts, notes will be taken to highlight important insights. The research team will regularly discuss the arguments for the selection.

In- and exclusion of Full-text selection

Two researchers will read full text and judge the feasibility of the articles. Criteria:

- The article contains a GR triage-message and/or discusses referral to rehabilitation.
- Characteristics of the research population match with internal medical hospital patients. Research population are not in majority patients with 'classic' GR diagnoses like stroke, hip fracture or amputation.

Charting of results

The research team will develop a charting form and extract information from the content of selected full text articles.

Summarizing the results

Author's name, year of publication.
Aim and research question, hypothesis, design.
Population: number of participants, demographics, (clinical characteristics of participants)
Setting (hospital, including rehabilitation ward of hospital)
Triage factors: characteristics of patients whether related to rehabilitation needs or describing rehabilitation potential.

Appendix B. Search string

PubMed

Search "Triage"[Mesh] OR "Referral and Consultation"[Mesh] OR "Patient Discharge"[Mesh] OR "Patient Transfer"[Mesh] OR "Patient Selection"[Mesh] OR "Triage"[Mesh] OR "Referral and Consultation"[Mesh] OR "Patient Discharge"[Mesh] OR "Patient Transfer"[Mesh] OR "Patient Selection"[Mesh] OR "Subacute Care"[Mesh] OR Triage*[tiab] OR Patient Discharg*[tiab] OR Patient Transfer*[tiab] OR Patient Selection*[tiab] OR consultation*[tiab] OR gatekeep*[tiab] OR counsel*[tiab] OR secondary care[tiab] OR secondary healthcare[tiab] OR care transition*[tiab] OR patient transfer*[tiab] OR patient transition*[tiab] OR patient recruit*[tiab] OR selection for treat*[tiab] OR subacute*[tiab] OR sub-acute*[tiab] OR postacute*[tiab] OR post-acute*[tiab] Sort by: Relevance Search "Hospitals"[Mesh] OR hospital*[tiab] Sort by: Relevance
Search "Convalescence"[MeSH] OR "Occupational Therapy"[MeSH] OR "Physical Therapy Modalities"[MeSH] OR "Rehabilitation"[MeSH] OR "Exercise Therapy"[Mesh] OR "Exercise Movement Techniques"[Mesh] OR "Physical Therapy (Specialty)"[MeSH] OR "Recovery of Function"[Mesh] OR "rehabilitation"[SH] OR rehabilitati*[tiab] OR physiotherap*[tiab] OR (physical[tiab] AND (therapy[tiab] OR therapies[tiab] OR activity[tiab] OR activities[tiab])) OR exercis*[tiab] OR training[tiab] OR (occupational[tiab] AND (therapy[tiab] OR therapies[tiab])) OR restorative care[tiab] Sort by: Relevance
Search ("Aged"[Mesh] OR "Aged, 80 and over"[Mesh] OR "Frail Elderly"[Mesh] OR "Geriatrics"[Mesh] OR "Geriatric Psychiatry"[Mesh] OR "Geriatric Nursing"[Mesh] OR "Geriatric Dentistry"[Mesh] OR "Dental Care for Aged"[Mesh] OR "Health Services for the Aged"[Mesh]) OR (elder*[tw] OR eldest[tw] OR frail*[tw] OR geriatri*[tw] OR old age*[tw] OR oldest old*[tw] OR senior*[tw] OR senium[tw] OR very old*[tw] OR septuagenarian*[tw] OR octagenarian*[tw] OR octogenarian*[tw] OR nonagenarian*[tw] OR centarian*[tw] OR centenarian*[tw] OR supercentenarian*[tw] OR older people[tw] OR older subject*[tw] OR older patient*[tw] OR older age*[tw] OR older adult*[tw] OR older man[tw] OR older men[tw] OR older male[tw] OR older woman[tw] OR older women[tw] OR older female[tw] OR older population*[tw] OR older person*[tw]) Sort by: Relevance

Embase

'patient referral'**/exp OR** 'hospital discharge'**/exp OR** 'patient selection'**/exp OR** 'subacute care'**/exp OR** triage***:ab,ti OR** referr***:ab,ti OR** 'patient discharg*'**:ab,ti OR** 'patient selection*'**:ab,ti OR** consultation***:ab,ti OR** gatekeep***:ab,ti OR** counsel***:ab,ti OR** 'secondary care'**:ab,ti OR** 'secondary healthcare'**:ab,ti OR** 'care transition*'**:ab,ti OR** 'patient transfer*'**:ab,ti OR** 'patient transition*'**:ab,ti OR** 'patient recruit*'**:ab,ti OR** 'selection for treat*'**:ab,ti OR** subacute***:ti,ab OR** 'sub acute*'**:ti,ab OR** postacute***:ti,ab OR** 'post acute*'**:ti,ab**
'hospital'**/exp OR** hospital**:ab,ti**
'rehabilitation'/exp OR 'physiotherapy'/exp OR 'kinesiotherapy'/exp OR 'convalescence'/exp OR rehabilitati*:ab,ti OR physiotherap*:ab,ti OR (physical:ab,ti AND (therapy:ab,ti OR therapies:ab,ti OR activity:ab,ti OR activities:ab,ti)) OR exercis*:ab,ti OR training:ab,ti OR (occupational:ab,ti AND (therapy:ab,ti OR therapies:ab,ti)) OR 'restorative care':ti,ab
'aged'/exp OR 'geriatrics'/exp OR 'elderly care'/exp OR elder*:de,ab,ti OR eldest:de,ab,ti OR frail*:de,ab,ti OR geriatri*:de,ab,ti OR (old NEXT/1 age*):de,ab,ti OR (oldest NEXT/1 old*):de,ab,ti OR senior*:de,ab,ti OR senium:de,ab,ti OR (very NEXT/1 old*):de,ab,ti OR septuagenarian*:de,ab,ti OR octagenarian*:de,ab,ti OR octogenarian*:de,ab,ti OR nonagenarian*:de,ab,ti OR centarian*:de,ab,ti OR centenarian*:de,ab,ti OR supercentenarian*:de,ab,ti OR 'older people':de,ab,ti OR (older NEXT/1 subject*):de,ab,ti OR (older NEXT/1 patient*):de,ab,ti OR (older NEXT/1 age*):de,ab,ti OR (older NEXT/1 adult*):de,ab,ti OR 'older man':de,ab,ti OR 'older men':de,ab,ti OR 'older male':de,ab,ti OR 'older woman':de,ab,ti OR 'older women':de,ab,ti OR 'older female':de,ab,ti OR (older NEXT/1 population*):de,ab,ti OR (older NEXT/1 person*):de,ab,ti

CINAHL

(MH "Triage") OR (MH "Referral and Consultation+") OR (MH "Patient Discharge+") OR (MH "Patient Selection") OR (MH "Subacute Care") OR TI (triage* OR referr* OR "patient discharg*" OR "patient selection*" OR consultation* OR gatekeep* OR counsel* OR "secondary care" OR "secondary healthcare" OR "care transition*" OR "patient transfer*" OR "patient transition*" OR "patient recruit*" OR "selection for treat*" OR subacute* OR sub-acute* OR postacute* OR post-acute*) OR AB (triage* OR referr* OR "patient discharg*" OR "patient selection*" OR consultation* OR gatekeep* OR counsel* OR "secondary care" OR "secondary healthcare" OR "care transition*" OR "patient transfer*" OR "patient transition*" OR "patient recruit*" OR "selection for treat*" OR subacute* OR sub-acute* OR postacute* OR post-acute*)
MH "Hospitals+") OR TI hospital* OR AB hospital*
(MH "Occupational Therapy+") OR (MH "Physical Therapy+") OR (MH "Rehabilitation+") OR (MH "Therapeutic Exercise+") OR (MM "Recovery") OR TI (rehabilitati* OR physiotherap* OR (physical AND (therapy OR therapies OR activity OR activities)) OR exercis* OR training OR (occupational AND (therapy OR therapies)) OR "restorative care") OR AB (rehabilitati* OR physiotherap* OR (physical AND (therapy OR therapies OR activity OR activities)) OR exercis* OR training OR (occupational AND (therapy OR therapies)) OR "restorative care")
MH "Aged+" OR MH "Aged, 80 and Over" OR MH "Frail Elderly" OR MH "Geriatrics" OR MH "Geriatric Psychiatry" OR MH "Gerontologic Nursing+" OR MH "Gerontologic Care" OR MH "Health Services for the Aged" OR TI (elder* OR eldest OR frail* OR geriatri* OR "old age*" OR "oldest old*" OR senior* OR senium OR "very old*" OR septuagenarian* OR octagenarian* OR octogenarian* OR nonagenarian* OR centarian* OR centenarian* OR supercentenarian* OR "older people" OR "older subject*" OR "older patient*" OR "older age*" OR "older adult*" OR "older man" OR "older men" OR "older male" OR "older woman" OR "older women" OR "older female" OR "older population*" OR "older person*") OR AB (elder* OR eldest OR frail* OR geriatri* OR "old age*" OR "oldest old*" OR senior* OR senium OR "very old*" OR septuagenarian* OR octagenarian* OR octogenarian* OR nonagenarian* OR centarian* OR centenarian* OR supercentenarian* OR "older people" OR "older subject*" OR "older patient*" OR "older age*" OR "older adult*" OR "older man" OR "older men" OR "older male" OR "older woman" OR "older women" OR "older female" OR "older population*" OR "older person*")

PsycInfo

(DE "Professional Referral") AND (DE "Psychiatric Hospital Discharge" OR DE "Hospital Discharge" OR DE "Discharge Planning") OR (DE "Client Transfer") OR (DE "Patient Selection") OR TI (triage* OR referr* OR "patient discharg*" OR "patient selection*" OR consultation* OR gatekeep* OR counsel* OR "secondary care" OR "secondary healthcare" OR "care transition*" OR "patient transfer*" OR "patient transition*" OR "patient recruit*" OR "selection for treat*" OR subacute* OR sub-acute* OR postacute* OR post-acute*) OR AB (triage* OR referr* OR "patient discharg*" OR "patient selection*" OR consultation* OR gatekeep* OR counsel* OR "secondary care" OR "secondary healthcare" OR "care transition*" OR "patient transfer*" OR "patient transition*" OR "patient recruit*" OR "selection for treat*" OR subacute* OR sub-acute* OR postacute* OR post-acute*) DE "Hospitals" OR DE "Psychiatric Hospitals" OR DE "Sanatoriums") "Recovery (Disorders)" OR DE "Rehabilitation" OR DE "Cognitive Rehabilitation" OR DE "Neuropsychological Rehabilitation" OR DE "Cognitive Rehabilitation" OR DE "Neurorehabilitation" OR DE "Occupational Therapy" OR DE "Physical Therapy" OR DE "Psychosocial Rehabilitation" OR DE "Therapeutic Social Clubs" OR DE "Vocational Rehabilitation" OR TI (rehabilitati* OR physiotherap* OR (physical AND (therapy OR therapies OR activity OR activities)) OR exercis* OR training OR (occupational AND (therapy OR therapies)) OR "restorative care") OR AB (rehabilitati* OR physiotherap* OR (physical AND (therapy OR therapies OR activity OR activities)) OR exercis* OR training OR (occupational AND (therapy OR therapies)) DE "Geriatrics" OR TI (elder* OR eldest OR frail* OR geriatri* OR "old age*" OR "oldest old*" OR senior* OR senium OR "very old*" OR septuagenarian* OR octagenarian* OR octogenarian* OR nonagenarian* OR centarian* OR centenarian* OR supercentenarian* OR "older people" OR "older subject*" OR "older patient*" OR "older age*" OR "older adult*" OR "older man" OR "older men" OR "older male" OR "older woman" OR "older women" OR "older female" OR "older population*" OR "older person*") OR AB (elder* OR eldest OR frail* OR geriatri* OR "old age*" OR "oldest old*" OR senior* OR senium OR "very old*" OR septuagenarian* OR octagenarian* OR octogenarian* OR nonagenarian* OR centarian* OR centenarian* OR supercentenarian* OR "older people" OR "older subject*" OR "older patient*" OR "older age*" OR "older adult*" OR "older man" OR "older men" OR "older male" OR "older woman" OR "older women" OR "older female" OR "older population*" OR "older person*")

Cochrane Library

#1 (elder* or eldest or frail* or geriatri* or "old age*" or "oldest old*" or senior* or senium or "very old*" or septuagenarian* or octagenarian* or octogenarian* or nonagenarian* or centarian* or centenarian* or supercentenarian* or "older people" or "older subject*" or "older patient*" or "older age*" or "older adult*" or "older man" or "older men" or "older male" or "older woman" or "older women" or "older female" or "older population*" or "older person*"):ti,ab,kw

#2 (rehabilitati* or physiotherap* or (physical and (therapy or therapies or activity or activities)) or exercis* or training or (occupational and (therapy or therapies)) or "restorative care"):ti,ab,kw

#3 Hospital*:ti,ab,kw

#4 (triage* or referr* or "patient discharg*" or "patient selection*" or consultation* or gatekeep* or counsel* or "secondary care" or "secondary healthcare" or "care transition*" or "patient transfer*" or "patient transition*" or "patient recruit*" or "selection for treat*" or subacute* or sub-acute* or postacute* or post-acute*):ti,ab,kw

Appendix C. The Arksey and O'Malley Framework of Scoping Studies

Identifying the research question.	Start with a wide definitions of study population, intervention or outcome, using a broad search strategy with clearly defined concepts and continuous refinement.
Identifying relevant studies.	Coverage as comprehensive as possible using different sources. Make practical decisions at the outset, concerning time span and languages
Study selection.	Inclusion and exclusion criteria are developed post-hoc, once familiarity with the literature is gained. Using multidisciplinary expertise and group consultation in the scoping team to inform and guide the clinical applicability of data for extraction.
Charting the data.	Data synthesis and interpretation may follow a narrative or descriptive approach, allowing for post-hoc development of data synthesis in terms of the value yielded by qualitative or quantitative analyses of results
Collating, summarizing and reporting the results.	An analytic or thematic framework to guide the narrative account of existing literature is recommended. Emphasis not on evaluating the weight or quality of evidence.
Consultation (optional)	Purpose of consultation is to inform and validate findings.

CHAPTER 4

ASSOCIATION OF VULNERABILITY SCREENING ON HOSPITAL ADMISSION WITH DISCHARGE TO REHABILITATION ORIENTED CARE AFTER ACUTE HOSPITAL STAY

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Abstract

Background

The short Dutch Safety Management Screening (DSMS) is applied at hospital admission to all 70+ patients to assess vulnerability. This screening of four geriatric domains aims to prevent adverse outcomes and may also support targeted discharge planning concerning post-acute care. We explored whether DSMS criteria of acutely admitted patients were associated with rehabilitation oriented care needs.

Methods

Retrospective cohort study of acutely admitted community living patients aged 70 years and older. Setting was a tertiary hospital. Demographics, morbidity and data on functional status, malnutrition, risk of falling, and delirium were studied. We used descriptive analysis and calculated risks, comparing discharge destination groups.

Results

Out of 491 hospital discharges, 349 patients (71.1%) returned home, 60 patients (12.2%) were referred to Geriatric Rehabilitation (GR) and 82 (16.7%) to other inpatient post-acute care. Non-home referral increased with age from 21% (70-80 years) to 61% (>90 years). A surgical diagnosis (OR 4.92 (95% CI 2.03-11.95)), functional decline represented by Katz-ADL positive screening (OR 3.79 (95% CI 1.76-8.14)) and positive risk of falling (OR 2.87 (95% CI 1.31-6.30)) were associated with non-home discharge. The Charlson Comorbidity Index did not reach significance between groups.

Conclusions

Admission diagnosis and vulnerability screening outcome were associated with discharge to rehabilitation oriented care in patients over 70 years of age**.** The usual care data of the DSMS vulnerability screening can raise awareness of discharge complexity and allows for opportunities to support timely and personalized transitional care.

Introduction

A growing number of older hospital patients can profit from rehabilitation oriented post-acute care to improve their functional outcome after hospital discharge (Grund et al., 2020; van Seben et al., 2019). However, age is not the identifying criterion for referral to geriatric rehabilitation. Multidisciplinary assessment and geriatric expertise must establish a genuine need for geriatric rehabilitation in older or vulnerable hospital patients (Bowles et al., 2009; de Groot et al., 2022). These post-acute care (PAC) decisions extend across healthcare settings and are professionally and managerial challenging to hospital teams (Goncalves-Bradley et al., 2022; Patel et al., 2019; Ubbink et al., 2014; Bai et al., 2019; Cruz-Jentoft et al., 2019).

To support PAC-decision making and enhance the coordination of services following discharge from hospital, discharge planning would preferably start from admission by following candidates for post-acute care (Liu et al., 2016; Oseran et al., 2019; Stefanacci et al., 2019). Patient characteristics such as a higher age, female sex, frailty, a lower functional or cognitive status at admission, comorbidity and length of hospital stay are associated with development of rehabilitation needs and functional impairments during hospital stay (Cho et al., 2017; Condorhuaman-Alvarado et al.,2017; Veronese et al., 2019). To prevent functional decline in vulnerable patients, as well as other adverse outcomes such as institutionalization, various vulnerability screening instruments were developed (Carpenter et al., 2017; Heim et al., 2015; Poh et al., 2020). The vulnerability score of the mandatory Dutch Safety Management System (DSMS) was introduced in Dutch hospitals in 2012 and has been applied since to all patients over 70 years of age at admission. The DSMS tool consists of short screening instruments in four geriatric domains: delirium, functional impairment, malnutrition and risk of falling (Warnier et al., 2020; Snijders et al., 2021; van Dam et al., 2021; Oud et al., 2021).

The early identification of vulnerable older patients at hospital admission aims to diminish the risk of functional decline during hospital stay by targeted in-hospital geriatric interventions. Subsequently, early and repeated assessments of rehabilitation needs, exploration of individual motivation and establishing an individual prognosis on recovery may identify geriatric rehabilitation candidates early during hospital stay and enhance personalized post-acute care decision making (Oseran et al., 2019; Stefanacci et al., 2019). Although the mandatory DSMS screening of seniors at hospital admission was not designed nor validated to identify rehabilitation patients, an association could exist between the 'risk of adverse outcome-profile' in older hospital patients and appropriateness of rehabilitation oriented care at discharge. Early profiling of potential geriatric rehabilitation candidates, using available demographic and clinical admission data including a vulnerability score may thus allow for early decision making concerning rehabilitation oriented post-acute care. Our hypothesis was that DSMS vulnerability scores differ between patients referred to geriatric rehabilitation and patients discharged

home. What patient characteristics concerning the DSMS screening domains are associated with referral to rehabilitation oriented care after hospital stay?

Methods

Setting and design

Amsterdam UMC is a large (1700 bed) tertiary academic medical center with two facilities. Both hospitals are situated in an urban health region and provide in specialized medical care for a large, predominantly urbanized region. One of the hospitals has a unit for geriatric rehabilitation. Skilled nursing facilities, nursing homes and private care organizations in the area provide rehabilitation-oriented post-acute care, consisting of geriatric rehabilitation and short-stay residential care. Short-stay residential care is indicated when an older patient temporarily needs nursing home care to recover (van den Besselaar et al.,2021). We undertook a retrospective cohort study of community living patients, aged over 70 years who were discharged from hospital between January 15, 2019 and May 15, 2019.

Patients

Hospital episodes of community living 70+ patients discharged after acute admission from one facility (VUmc) were included. We defined acute admission as an admission following emergency room admission. Minimum hospital stay was one night. If a patient was admitted more than once during the research period, the last hospital episode following an acute admission was included. Admissions ending in death were excluded and patients discharged to other hospitals were excluded. Patients discharged to the in-hospital geriatric rehabilitation unit were included. Three sub-cohorts of patients were formed according to discharge destination, i.e. home, geriatric rehabilitation and other post-acute care in a nursing home. Usual care data were extracted from medical records. Demographic variables consisted of age, sex, place of residence before admission and discharge disposition whether home, nursing home or other hospital. Data on living situation were not available. Clinical data were: attending medical specialism, admission diagnosis, comorbidities and DSMS data on functional status, nutritional status, risk of falling and presence of delirium symptoms. DSMS data were assembled within 48 hours of admission. Information concerning consultant specialists, paramedical treatment and length of hospital stay was assembled as well. Discharge destination to inpatient post-acute care was specified as geriatric rehabilitation or other nursing home care.

Measurement instruments

The Dutch Safety Management System vulnerability screening is shown in Table 1. It consists of the Simplified nutritional assessment questionnaire (SNAq) for nutritional status, Katz-ADL for functional status and screening questions on delirium and falls (Rolland et al., 2012; Katz et al., 1963; Gerrard et al., 2013). In the population under study the adapted version of DSMS was used. Risk of falling was assessed with the Johns

Hopkins risk of falls assessment tool (JHRFAT) instead of one question on history of falling. The JHRFAT is a widely used instrument measuring age, falls history, incontinence, medication, use of patient care equipment, mobility and cognition. A result of 6-13 points indicates a moderate fall risk, a score over 13 points a severe risk (Klinkenberg et al., 2017; Kim et al., 2022). To establish symptoms of confusion the Delirium Observation Screening scale (DOS) was applied. It concerns 13 items, comprising seven domains (consciousness, attention, thinking, memory/orientation, psychomotor activity, mood and perception) and was applied for presence of delirium symptoms instead of three screening questions on symptoms of confusion. Each item of the DOS is scored during one 8-hour nurse-shift (day/evening/night). A score of 3 or more points is positive (Schuurmans et al., 2003; Park et al., 2021).

Table 1. Original and adapted DSMS vulnerability screening

	Original DSMS screening	Adapted DSMS screening
Functional status	Katz-ADL ≥2=1 point	Unchanged
Nutritional status	SNAq≥2=1 point	Unchanged
Falls risk	Q: Did you fall during the last 6 months? Yes=1 point	JHRFAT≥6=1 point
Delirium	Q: Do you have memory problems (Y/N); did you need help in basic ADL, in the last 24 hours (Y/N); did you previously experience confusion (Y/N) ≥1 Yes=1 point	DOSs≥3=1 point
DSMS score	0-4 points	Unchanged
Vulnerability	Age<80 and ≥3 points Age≥80 and ≥1 point	Unchanged

DSMS=Dutch short safety management screening. Katz-ADL=Katz activities of daily living score. SNAq=Short nutritional assessment questionnaire. Q=Question. JHRFAT=Johns Hopkins risk of falls assessment tool. DOSs=Delirium observation screening scale.

In the DSMS tool the score of each separate instrument is dichotomized into presence or absence of risk and added up to the DSMS score for vulnerability with a range of 0-4. Patients aged 70-79 are deemed vulnerable when the DSMS score is ≥3, patients aged 80 or older when the DSMS score is ≥ 1 (Heim et al., 2015; Warnier et al., 2020). Table 1 shows the components of the DSMS vulnerability score and the calculation of vulnerability. The age adjusted Charlson Comorbidity index (CCI), based on reported comorbidities, adds one point for every decade over 40 years of age (Bernard et al., 2016).

Analysis

Data was analyzed with IBM SPSS Statistics (version 26 IBM, Armonk, NY, USA) software. According to discharge destination after hospital stay, data was divided into 'home'(H), 'geriatric rehabilitation'(GR) and 'other nursing home care'(NH). Comorbidity

data was computed into the age-adjusted-Charlson Comorbidity Index (CCI) (Glasheen et al., 2019). When Katz-ADL or JHFRAT were assessed more than once during hospital stay, the last score was analyzed. Next to DOSs ≥3, the number of positive DOSs (≥3) was used as an additional variable.

Data were analyzed according to discharge destination (H, GR, NH). For analysis of total inpatient PAC discharge, GR and NH group were combined to 'Non-Home group'. To compare between groups we used $\chi 2$ tests for nominal data, Kruskal Wallis tests for ordinal data and t-tests for normally distributed continuous data. In accordance with the original DSMS screening, scores of the adapted DSMS were dichotomized into presence or absence of risk to calculate the vulnerability score. Odds ratio's (OR) with 95% confidence intervals of independent variables 'age', 'surgical diagnosis', 'age-adjusted CCI' and the DSMS criteria were calculated using logistic regression analysis comparing home and non-home discharge. Bivariate correlations were inspected (Pearson coefficient). To calculate the OR for the age-adjusted CCI, data were dichotomized according to the median value (6) in our cohort (Bonaventura et al., 2019; Chang et al., 2016).

Ethics

The Medical Ethics Committee of the University Medical Centers Amsterdam reviewed and approved the study protocol under file 2018621.

Results

The flow diagram on inclusion is in figure 1. A total of 491 patient records was included. Of these, 349 (71.1%) patients were discharged home (H), 60 (12.2%) to geriatric rehabilitation (GR) and 82 (16.7%) to other nursing home care (NH). In this 'other nursing home care' group a majority (75.6%) was referred to short-stay residential care, recovery care in a nursing home for general medical needs that do not require medical specialist care or geriatric rehabilitation. A minority in this group (24.4%) was referred to palliative intermediate care or long term care. An overview of the NH group is in the Supplementary information A.

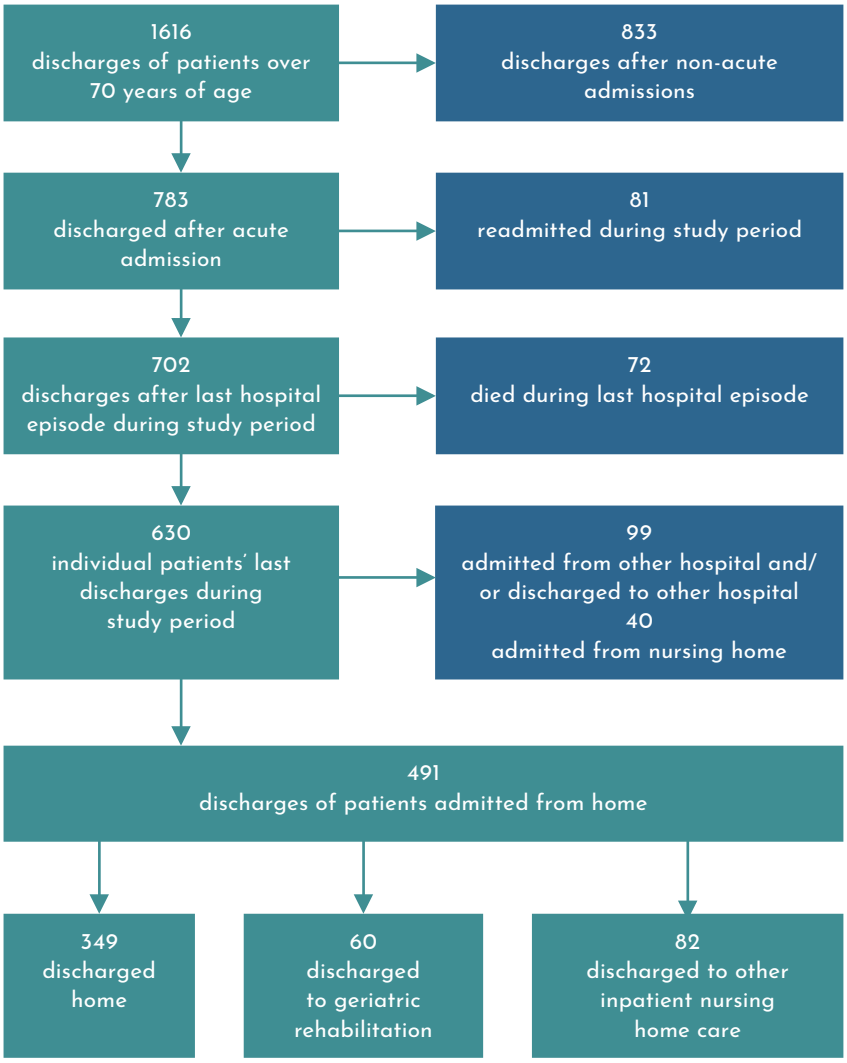

Figure 1. Flow diagram of inclusion

Demographics and comorbidity

Overall, 55.4% of patients were male. In the Home group 59.3% were men. Sexes were evenly matched in the geriatric rehabilitation group; in the nursing home-group 42.7% were men. In the 71-80 years of age group, 79% were discharged home, 11% to geriatric rehabilitation and 10% to other nursing home care. In patients over 90 years, discharge destinations changed to 39% home, 23% geriatric rehabilitation and 38% other nursing home care. An overview of these data is in Table 2.

Table 2. Demographics, referring specialism and co-morbidity in discharge destination groups

	Home (HOME)		**Geriatric rehabilitation (GR)**		**Nursing Home (NH)**		
N=491 (%)	N=349 (71.1%)		N=60 (12.2%)		N=82 (16.7%)		N=491 (100%)
Sex	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Total
71-80 years N=283 (57.7%)	79%		11%		10%		100%
	134 (64.8%) (47.3%)	90 (63.4%) (31.8%)	19 (63.3%) (6.7%)	11(36.7%) (3.9%)	18 (51.4%) (6.4%)	11(23.4%) (3.9%)	283 (100%)
81-90 years N=169 (34.4%)	65%		12%		23%		100%
	68 (32.8%) (40.2%)	42 (29.6%) (24.9%)	9 (30.0%) (5.3%)	12(40.0%) (7.1%)	13 (37.1%) (7.7%)	25(53.2%) (14.8%)	169 (100%)
≥ 90 years N=39 (7.9%)	39%		23%		38%		100%
	5 (2.4%) (12.8%)	10 (7.0%) (25.6%)	2 (6.7%) (5.1%)	7 (23.3%) (18.0%)	4 (11.4%) (10.3%)	11(23.4%) (28.2%)	39 (100%)
All ages	207 (59.3%)	142 (40.7%)	30 (50.0%)	30 (50.0%)	35 (42.7%)	47 (57.3%)	
Attending specialism	**HOME (%)**		**GR (%)**		**NH (%)**		**p-value** <0.001
Internal medicine	124 (35.5)		3 (5.0)		33 (40.2)		
Trauma, orthopedics	(44) (12.6)		42 (70.0)		17 (20.7)		
Neurology, neurosurgery	(45) (12.9)		5 (8.3)		21 (25.7)		
Gastro-enterology	28 (8.0)		1 (1.7)		2 (2.4)		
Cardiology	(27) 7.7		1 (1.7)		0 (0.0)		
Pulmonary diseases	52 (14.9)		2 (3.3)		5 (6.1)		

Table 2. Continued

	Home (HOME)	Geriatric rehabilitation (GR)	Nursing Home (NH)	
Other specialisms	29 (8.3)	6 (10.0)	4 (4.8)	
	349 (100)	60 (100)	82 (100)	
Comorbidity	HOME	GR	NH	p-value
CCI* Mean (SD)	2.78 (2,918)	2.92 (3,196)	2.82 (3,043)	0.990
Age-adjusted CCI Mean (SD)	7.18 (2,966)	7.57 (3,158)	7.65 (2,953)	0.186
Days in hospital Median (IQR)	3 (1.0-6.0)	10 (6.0-18.5)	10 (6.0-15.8)	<0.001

Of GR patients, 70% were acute orthopedic or trauma patients in contrast to the Home-group with 12.6% surgical patients. Internal medical patients represented 35.5% of the Home group, 5.0% of the GR group and 40.2% of the NH group. Neurological or neurosurgical patients constituted 12.9% of the Home-group, 8.3% of GR and 25.7% of the NH group. The mean age-adjusted CCI was 7.18 in the Home-group, 7.57 in GR group and 7.65 in the NH-group (p=0.186). Overviews of comorbidity data and main diagnoses are presented in Supplemental material B and C.

DSMS-vulnerability screening

DOS scores were missing in 52% of the participants, SNAq scores in 16%, Katz-ADL in 13%.

JHFRAT data were complete. Symptoms of delirium (DOS ≥3) presented in 37% of Home-group patients, 49% of GR patients, 63% of NH patients and 57% of all non-home discharged patients. Delirium symptoms registered on two or more days were present in 6% of Home patients, 16% of GR- patients, 27% of NH and 22% of all non-home patients. Functional status was low in 28% of patients discharged home versus 79% of GR patients, 69% of NH and 73% of all non-home discharged patients. A medium or high risk of falling was found in 52% in the Home- group, 73% of GR patients, 82% of NH patients and 78% of all non-home discharged patients.

DSMS vulnerability scores were present in 30% of Home-group patients and 70% of non-home patients. Vulnerability according to DSMS score was present in 44% of Home patients, 67% of GR patients, 75% of NH patients and 72% of all non-home discharged patients. Table 3 presents an overview of these data, graphs are in Supplemental material D and E.

Table 3. DSMS vulnerability screening in discharge destination groups

DSMS criteria	HOME N=349 (%)	GR N=60 (%)	NH N=82 (%)	p-value	GR+NH N=142 (%)	p-value
Delirium	N=127	N=45	N=62		N=107	
0 DOSs ≥3 (%)	80 (63.0%)	23 (51.1%)	23 (37.1%)	<0.001	46 (43.0%)	<0.001
1 DOSs ≥3 (%)	19 (15.0%)	7 (15.6%)	10 (16.1%)		17 (15.9%)	
2-6 DOSs ≥3 (%)	21 (16.5%)	8 (17.8%)	12 (19.4%)		20 (18.7%)	
≥ 7 DOSs ≥3 (%)	7 (5.5%)	7 (15.6%)	17 (27.4%)		24 (22.4%)	
Nutritional status	N=290	N=54	N=76		N=130	
SNAq 0-1 (%)	217 (74.8%)	39 (65.0%)	57 (69.5%)	0.960	96 (67.6%)	0.991
SNAq 2 (%)	10 (3.4%)	5 (8.3%)	5 (6.1%)		10 (7.0%)	
SNAq >2 (%)	63 (21.7%)	10 (16.7%)	14 (17.1%)		24 (16.9%)	
Functional status	N=292	N=57	N=78		N=135	
Katz-ADL <2	210 (71.9%)	12 (21.1%)	24 (30.8%)	<0.001	36 (26.7%)	<0.001
Katz-ADL ≥2 (%)	82 (28.1%)	45 (78.9%)	54 (69.2%)		99 (73.3%)	
Risk of Falls	N=349	N=60	N=82		N=142	
JHFRAT 0-6 (%)	169 (48,4%)	16 (26,7%)	15 (18.3%)	<0.001	31 (21.8%)	<0.001
JHFRAT 7-13 (%)	151 (43,3%)	30 (50,0%)	44 (53.7%)		74 (52.1%)	
JHFRAT >13 (%)	29 (8,3%)	14 (23,3%)	23 (28.0%)		37 (26,1%)	
Vulnerability	HOME N=349	GR N=60	NH N=82		GR+NH N=142	
DSMS						
Completed (%)	107 (30.6%)	42 (70.0%)	57 (69.5%)		99 (69.7%)	0.001
Vulnerable (%)	47 (43.9%)	28 (66.7%)	43 (75.4%)	<0.001	71 (71.7%)	<0.001
DSMS score	N=107	N=42	N=57		N=99	
0	27 (25.2%)	0 (0.0%)	4 (7.0%)	<0.001	4 (4.0%)	<0.001
1	30 (28.0%)	6 (14.3%)	5 (8.8%)		11 (11.1%)	
2	25 (23.4%)	21 (50.0%)	15 (26.3%)		36 (36.4%)	
3	22 (20.6%)	10 (23.8%)	24 (42.1%)		34 (34.3%)	
4	3 (2.8%)	5 (11.9%)	9 (15.8%)		14 (14.1%)	

DSMS=Dutch short safety management screening. DOSs=Delirium observation screening score. SNAQ=Short nutrition assessment questionnaire. Katz-ADL= Katz activities of daily living score. JHFRAT= Johns Hopkins fall risk assessment tool. GR=Geriatric rehabilitation. NH= inpatient nursing home care, not geriatric rehabilitation.

Non-home discharge

Acute orthopedic or trauma patients (adjusted OR 4.92 (95% CI 2.03-11.95)) had higher odds for non-home discharge. The odds for non-home discharge were highest for patients with functional impairment represented by positive Katz-ADL (OR 3.79 (95% CI 1.76-8.13)) and JHFRAT scores on risk of falling (OR 2.87 (95% CI 1.31-6.29)). No association was found between positive DOSs (OR 2.12 (95% CI 0.99-4.55)) or SNAQ screening (OR 1.64 (95% CI 0.73-3.70) and non-home discharge. Table 4 shows an overview of crude and adjusted OR's.

Table 4. Crude and adjusted Odds Ratio's in Non-home versus Home discharged patients

Independent variable	Crude OR Non-home vs. Home (95% CI)	Adjusted OR Non-home vs. Home (95% CI)
Age >80 years	2.52 (1.69-3.76)	1.82 (0.71-4.62)
Acute orthopedic or trauma patient	4.93 (3.11-7.80)	4.92 (2.03-11.95)
Age-adjusted CCI ≥6	1.22 (0.89-1.68)	1.19 (0.62-2.28)
Katz-ADL ≥ 2	7.04 (4.45-11.15)	3.79 (1.76-8.13)
JHFRAT ≥ 6	5.01 (3.13-7.99)	2.87 (1.31-6.29)
DOSs ≥3	2.26 (1.33-3.82)	2.12 (0.99-4.55)
SNAq ≥ 2	1.05 (0.66-1.69)	1.64 (0.73-3.70)
DSMS-Vulnerability	3.24 (1.81-5.78)	0.97 (0.35-2.68)

CCI=Charlson comorbidity index. DOSs= Delirium observation screening score. Katz-ADL=Katz activities of daily living score. JHFRAT= Johns Hopkins fall risk assessment tool. SNAq= Short nutrition assessment questionnaire. DSMS=Dutch short safety management screening.

Discussion

In this cohort of older acutely admitted, community living patients, two sub-scores of the DSMS vulnerability tool were associated with discharge to geriatric rehabilitation or other nursing home care. The usual care data on vulnerability contained valuable information for post-acute care decision making. Most distinctive between home and non-home hospital discharge were the DSMS sub-scores on functional status (Katz-ADL) and risk of falling (JHFRAT). Both are multi-domain measurement instruments.

DSMS vulnerability screening

In previous studies on the predictive properties of the DSMS vulnerability score, contradicting conclusions were reached concerning early readmissions and mortality in older hospital patients (Snijders et al., 2021; van Dam et al., 2021; Schuijt et al., 2020). No association between DSMS vulnerability and mortality, complications or readmission was found in geriatric, older cardiac and older gynecological patients (Warnier et al., 2020; Oud et al., 2015; Jepma et al., 2021; van der Zanden et al., 2021). In hip fracture patients, however, the DSMS vulnerability score was positively associated with mortality and a complicated rehabilitation trajectory (Folbert et al., 2017; Winters et al., 2018). Low to moderate prognostic accuracy was reported concerning functional decline, morbidity, hospital readmission, institutionalization and long-term survival (Warnier et al., 2020).

In a cohort of patients discharged from a geriatric ward, a positive score on all four domains of the DSMS vulnerability tool was associated with post-discharge institutionalization; the type of post-acute care was not specified (Oud et al., 2021). In our cohort of older patients discharged from all hospital wards, a positive association was

found between DSMS vulnerability subscores and referral to rehabilitation-oriented post-acute care. Odds were highest for positive scores of Katz-ADL (functional domain) and JHFRAT (risk of falling). This finding is in line with evidence that functional metrics are significant predictors of multiple hospital outcomes, including the likelihood of discharge home and the risk of poorer functional status after acute care (So et al.,2019). As functional recovery and safe mobility imply important geriatric rehabilitation goals, the adapted DSMS screening enhances awareness of rehabilitation needs, thus targeting potential candidates for geriatric rehabilitation at an early stage.

Non-home discharge in hip fracture patients

The majority of participants in the geriatric rehabilitation group were trauma or acute orthopedic patients over 80 years of age. As in our study, the Dutch Hip-fracture cohort study found seniority, premorbid mobility problems and premorbid Katz-ADL as independent predictors for discharge to geriatric rehabilitation vs discharge home (van Dartel et al., 2021). The original DSMS did not include a separate mobility screening, but the JHFRAT in the adapted DSMS contains three mobility items: the need for supervision or assistance when walking, unsteady walking and sensory loss affecting mobility. A positive JHFRAT score in our cohort had positive odds for non-home discharge (adjusted OR 2.87 (1.31-6.29)). In the Dutch Hip-fracture cohort a premorbid higher Katz-ADL score and a history of dementia distinguished between discharge to a nursing home and discharge home (van Dartel et al., 2021). In our study 'DOSs ≥3', indicative for presence of delirium symptoms, did not show positive odds for non-home discharge from hospital (OR 2.12 (0.99-4.55). Other studies that found delirium in hip fracture patients to be an independent predictor of adverse outcome could not be confirmed in our study (Low et al., 2021; Lisk et al., 2020; Dolan et al., 2000).

Vulnerability and discharge decision making

In this cohort a positive DSMS vulnerability score at hospital admission indicated a certain likelihood of rehabilitation needs. Being vulnerable or mildly frail does not imply absence of rehabilitation potential (de Groot et al., 2022). The identification of future geriatric rehabilitation candidates presents an opportunity to optimize in-hospital geriatric care and personalize post-acute care decision making. A positive vulnerability score inspires to explore all factors relevant for decision making. Comprehensive geriatric assessment (CGA), multidisciplinary team meetings and the involvement of patients and families can effectively contribute to patient-centered discharge planning (Ellis et al., 2017). Frailty measures, such as the CGA-related frailty index can have prognostic means for rehabilitation outcome (Arjunan et al., 2018; Schuijt et al., 2021). This frailty index, as well as the DSMS vulnerability score can be derived from automated data and facilitate discharge decision making by early identifying patients that may need a post-acute care decision later (Bowles et al., 2019).

Limitations

We analyzed data of acutely admitted patients that were discharged from a single tertiary hospital, both choices may have influenced the case-mix. We assumed that discharges of acutely admitted patients were most representative for our research question, since admission to rehabilitation oriented post-acute care requires acute functional loss. This restriction and the ongoing reorganization in the two hospitals may have accounted for change of patient flow, resulting in a high percentage of trauma patients and few neurological patients in our cohort.

We encountered limitations within our data set as well. No data on living arrangements were available to us whereas living alone is an influential factor in post-acute care referral decisions. Privacy laws did not allow to make these data available. Secondly, almost 50% of the adapted-DSMS screening data on delirium was missing. We understood that only when confusion was observed at hospital admission, the DOS score was applied. The missing DOS scores explain the low percentage of completed DSMS vulnerability scores. Instruction on the application of this sub-score is important to avoid missing data. The comprehensiveness of both DOS and JHFRAT may influence the feasibility of the DSMS score.

Strengths

This is the first Dutch study to address the relation between routine hospital admission vulnerability screening and discharge to geriatric rehabilitation. DSMS data are available in electronic health records in all Dutch hospitals and identify potential candidates for rehabilitation-oriented post-acute care. These findings support hospital practice concerning geriatric treatment; they also facilitate timely and careful addressing of discharge dilemmas.

As the JHRFAT in the adapted DSMS is a multi-dimensional 'geriatric' measurement instrument for risk of falling, it may have accounted for a higher accuracy of vulnerability measurement than the one screening question on falls of the original DSMS.

Recommendations

The DSMS vulnerability data can be used to anticipate discharge decision making. Timely PAC-decision making by liaison nurses, geriatricians or rehabilitation specialists adds to the quality of transitional care. Information on living situation and family support can further contribute to the decision making.

Inclusion of vulnerability scores in handovers can help to evaluate progress during rehabilitation. Frailty status may change during rehabilitation. ADL status before hospital admission represents a parameter for goal setting in rehabilitation and supports monitoring of functional gain.

In order to properly assess the association between vulnerability, appropriateness of referral decisions and outcome of rehabilitation-oriented post-acute care we recommend a prospective cohort study with follow-up after transfer to rehabilitation-oriented PAC.

Conclusions and implications

DSMS vulnerability screening with a higher domain score on functional impairment and risk of falling marked the higher odds for non-home discharge. Older surgical patients were most at risk of transfer to post-acute care. The usual care data of the vulnerability screening at hospital admission can trigger the awareness of professionals towards rehabilitation-oriented care needs at discharge; this facilitates an early diligent dialogue with older patients and their families on preferred treatment and care after hospital discharge.

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Supplemental Files

Supplemental file A. Post-acute care in the NH group

	N=82 (%)
Geriatric rehabilitation	0 (0)
Short-stay residential care-intensive	60 (73.2)
Short-stay residential care-regular	2 (2.4)
Rehabilitation in long-term care*	6 (7.3)
Long-term care	9 (11.0)
Palliative short-stay residential care	4 (4.9)
Missing	1 (1.2)
Total	82 (100)

** The patient receives extra paramedic treatment in long-term care.*

Supplemental file B. Comorbidity in discharge destination groups

Comorbidity	Home N=345 (%)	Geriatric Rehabilitation N=60 (%)	Other Nursing Home care N=82 (%)	p-value
Myocardial infarct	63(12.9)	7 (11.7)	4 (4.9)	0.045
Congestive heart failure	38 (11.7)	7 (11.7)	12 (14.6)	0.657
Periferal vascular disease	25 (7.2)	8 (13.3)	5 (6.1)	0.220
Cerebral vascular accident	13 (3.8)	3 (5.0)	5 (6.1)	0.622
Dementia	10 (2.9)	1 (1.7)	5 (6.1)	0.259
Pulmonary disease	26 (7.5)	4 (6.7)	1 (1.2)	0.108
Connective tissue disorder	13 (3.8)	1 (1.7)	2 (2.4)	0.627
Peptic ulcer	missing	missing	missing	
Mild liver disease	5 (1.4)	1 (1.7)	1 (1.2)	0.975
Diabetes	49 (14.2)	11 (18.3)	15 (18.3)	0.521
Diabetes with complications	13 (3.8)	2 (3.3)	2 (2.4)	0.838
Hemi/paraplegia	6 (1.7)	2 (3.3)	10 (12.2)	<0.001
Renal disease	66 (19.1)	8 (13.3)	19 (23.2)	0.338
Cancer	57 (16.5)	10 (16.7)	11 (13.4)	0.780
Metastatic cancer	48 (13.9)	11 (18.3)	9 (11.0)	0.458
Severe liver disease	3 (0.9)	0 (0.0)	0 (0.0)	0.537
HIV*	missing	missing	missing	

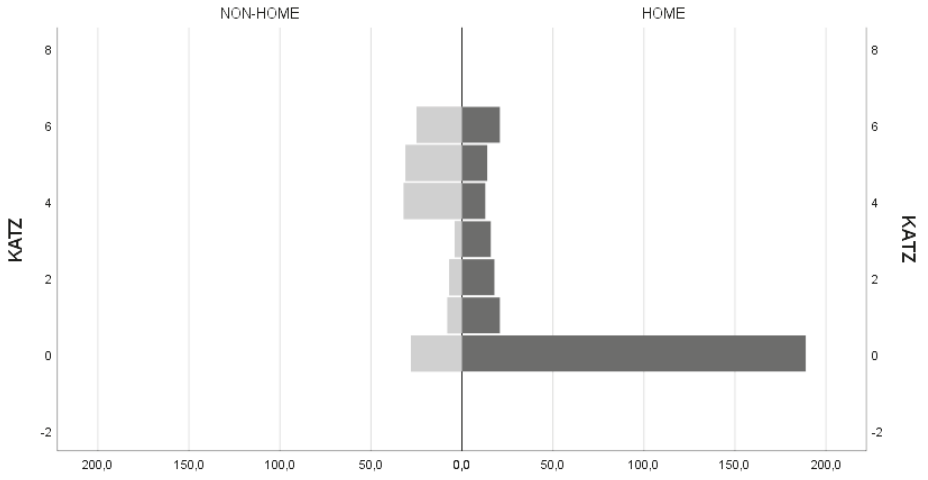
**Human Immunodeficiency virus*

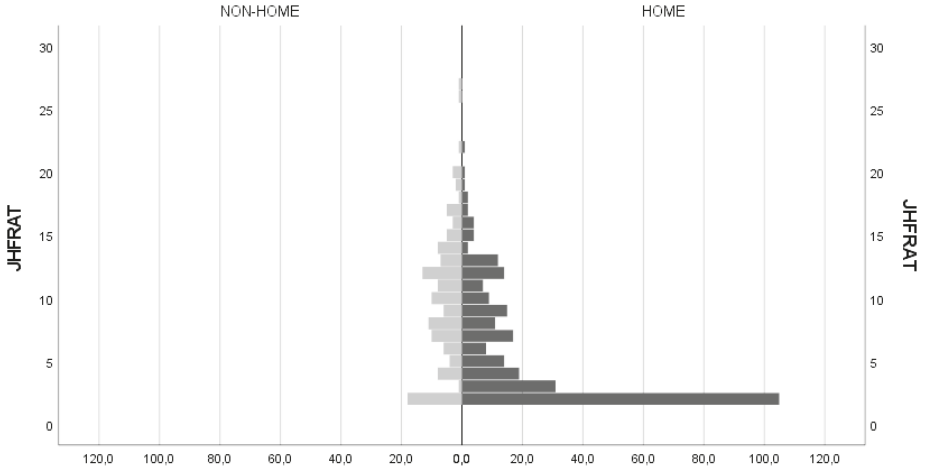
Supplemental file C. ICD-10* Classification of main diagnosis

Chapter	Description	Home	Geriatric rehabilitation	Other Nursing Home care
A B	Infectious and parasitic diseases	12 (3.5)	0 (0.0)	0 (0.0)
C	Neoplasms	39 (11.3)	11 (18.3)	7 (8.5)
D	Blood and immune system	16 (4.6)	0 (0.0)	0 (0.0)
E	Endocrine, nutritional, metabolic diseases	7(2.0)	1(1.7)	1 (1.2)
F	Mental and behavioral diseases	3 (0.9)	0 (0.0)	3 (3.7)
G	Nervous system	8 (2.3)	0 (0.0)	3 (3.7)
H	Eye and adnexa, ear and mastoid	2 (0.6)	1 (1.7)	0 (0.0)
I	Circulatory system	62 (17.9)	5 (8.3)	12 (14.6)
J	Respiratory system	62 (17.9)	3 (5.0)	15 (18.3)
K	Digestive system	43 (12.4)	7 (11.7)	6 (7.3)
L	Skin and subcutaneous tissue	6 (1.7)	0 (0.0)	0 (0.0)
M	Musculoskeletal system and connective tissue	7 (2.0)	3 (5.0)	5 (6.1)
N	Genitourinary system	16 (4.6)	2 (3.3)	6 (7.3)
S T	Injury, poisoning, consequences of external causes	29 (8.4)	27 (45.0)	21 (25.6)
R	Symptoms and findings not elsewhere classified	31 (9.0)	0 (0.0)	3 (3.7)
	Unknown	3	0	0

**ICD-10 International Classification of Diseases and related Health problems.*

Supplemental file D. DSMS domain scores in non-home versus home discharged group





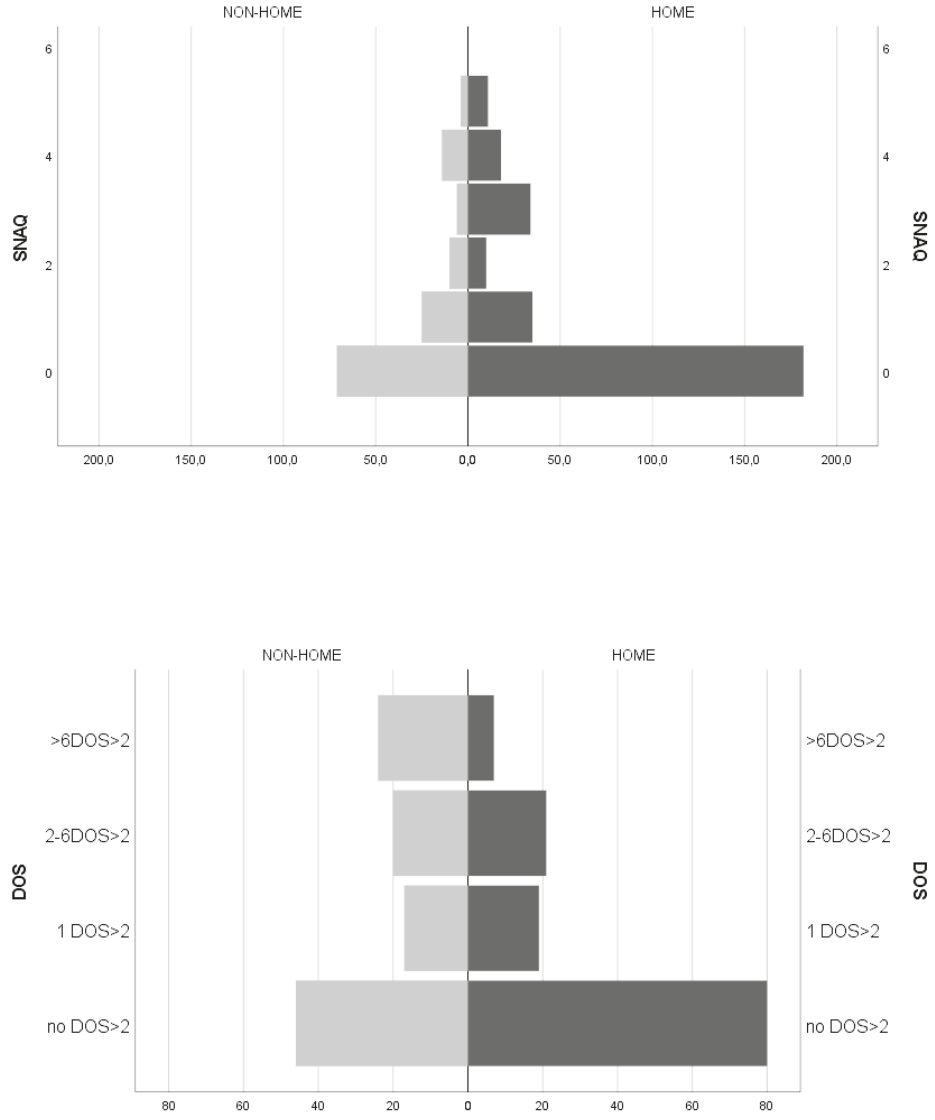


Figure 1. D. DSMS domain scores in non-home versus home discharged group
DSMS=Dutch short safety management screening. Katz-ADL= Katz activities of daily living score (0-6). JHFRAT=Johns Hopkins falls risk assessment tool. SNAQ= Short nutrition assessment questionnaire (0-4). DOS= Delirium observation scale. (No DOS>2; 1 DOS>2; 2-6DOS>2; >6DOS>2)

Supplemental file E. Distribution of DSMS scores (0-4) in non-home (N=99) and home (N=107) discharged patients

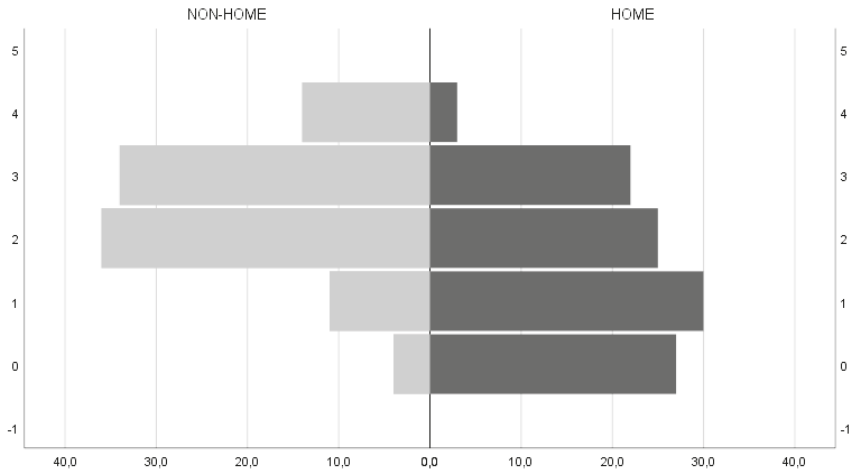


Figure 2. E. Distribution of DSMS scores (0-4) in non-home (N=99) and home (N=107) discharged patients
DSMS=Dutch short safety management screening

CHAPTER 5

REFERRAL TO GERIATRIC REHABILITATION IN THE NETHERLANDS, AN EXPLORATORY STUDY OF PATIENT CHARACTERISTICS

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Abstract

Purpose

Geriatric rehabilitation is intended for older adults with vulnerability, comorbidity and acute functional impairments. To explore and evaluate referral criteria, this study followed hospital patients referred for rehabilitation in nursing homes.

Design

Exploratory, retrospective cohort study.

Methods

Participants were community living before acute hospitalization and referred for geriatric rehabilitation between January 15 and May 15, 2019. Data was collected at hospital admission, hospital discharge and discharge from rehabilitation-oriented care. Outcome measure was the final discharge destination.

Results

Out of 87 hospital patients referred for rehabilitation (mean age 76.3 (SD 10.7)), 73 received rehabilitation oriented post-acute care and 60 (82.2%) returned home after rehabilitation. Premorbid functional status was regained by 45 (61.6%) participants and mobility by 40 (54.8%). Independent baseline mobility, no complications during post-acute care, fewer cognitive symptoms and multidomain vulnerability were associated with discharge home after rehabilitation.

Clinical Relevance to Rehabilitation Nursing

A multidomain assessment can make vulnerability applicable in referral decisions and induce tailored individual rehabilitation programs.

Conclusion

This study explored the case-mix characteristics of hospital patients following rehabilitation trajectories. No frailty measures were available; vulnerability was refined into physical, cognitive and social components. Careful assessment of vulnerability can support personalized referral decision making.

Introduction

The aging of the population, together with advances in the treatment of diseases in later life and a restricted duration of hospital stay have vastly increased the demand for inpatient follow-up care at hospital discharge (Werner and Konetzka, 2018, Wammes et al., 2023). In response to these demands and following the 'Aging in Place' policy, rehabilitation-oriented post-acute care has further developed. Geriatric rehabilitation (GR) in nursing homes or skilled nursing facilities became a popular inpatient type of post-acute care (PAC) and its efficacy, equity and quality of care grew into a subject of international research. One of these emerging research questions entailed a clear definition of the target group of geriatric rehabilitation care in order to justify referral decisions (van Balen et al., 2019, Grund et al., 2020, Jesus and Hoenig, 2015). A practicable, realistic description of the characteristics of the target group was considered relevant for appropriate GR-referral (Muscat et al., 2022).

Geriatric rehabilitation consists of short-term, inpatient trajectories of goal oriented multidisciplinary treatment, integrated with rehabilitation nursing and medical care. This type of rehabilitation care is targeted at and adapted to older adults with vulnerability who experience acute functional impairment. Diagnoses preceding GR trajectories are fragility fractures, stroke, amputation, other major surgery and internal medical illnesses accompanied by severe functional deterioration. Frequently the consequences of these acute events impose on pre-existing impairments (Grund et al., 2020, Bachmann et al., 2010, Keeney et al., 2020). Referral to GR thus is recommended when comprehensive and cohesive multidisciplinary treatment at a slower pace is indispensable to resume one's former level of social participation, preferably by returning to the original living situation. Vulnerability and comorbidity are regarded core characteristics of patients needing GR, as opposed to those, who can benefit from intensive medical specialist rehabilitation programs (de Jesus et al., 2021, Amieva et al., 2022). Contrary to comorbidity that is captured in the medical history, vulnerability is frequently unreported in medical records and absent in handovers to post-acute care. We hypothesized that vulnerability status is an essential element in GR referral decision making, next to rehabilitation diagnosis, comorbidity, functional status and rehabilitation needs (Bean et al., 2019, Cowley et al., 2021).

The concepts of vulnerability and frailty have been extensively studied in social science and health care leading to operationalization of frailty as an age-related clinical condition characterized by an increased susceptibility to stressors and an elevated risk of adverse outcomes such as mortality (Dent et al., 2023, Rodríguez-Mañas and Rodriguez-Sánchez, 2021). Frailty measurement instruments, such as the Clinical frailty scale and the Edmonton frailty scale classify vulnerability as a pre-frail or mildly frail status (Church et al., 2020). Levasseur and colleagues recently proposed to approach vulnerability as

a situation wherein physical, psychological and social difficulties may interact to increase the risk of a negative impact on life (Levasseur et al., 2022).

In the Netherlands a vulnerability screening of older individuals at hospital admission was introduced in 2008. This screening of functional, nutritional, cognitive and fall-risk status aimed to identify persons that needed geriatric care during hospital stay. A positive screening of the two physical vulnerability factors, functional impairment and risk of falling at hospital admission, was associated with referral to rehabilitation oriented PAC at hospital discharge (de Groot et al., 2023b).

In addition to these physical manifestations, symptoms of vulnerability may be cognitive, such as memory deficits and mood problems or social, such as living alone, having a small network or suffer from substance abuse (Gill et al., 2022, Khalil and Gobbens, 2023). Social vulnerability determinants are associated with frailty and functional decline, but their impact is relatively unexplored in connection with referral to geriatric rehabilitation or the association with its outcome (Cappelli et al., 2020, Engelberg Anderson et al., 2020, Godin et al., 2019). 'Diminished endurance for therapy', pointing out physical frailty, is considered an eligibility criterion for geriatric rehabilitation, whereas pre-admission vulnerability and signs of vulnerability like delirium or impaired disease insight may be equally relevant to the outcome of rehabilitation. The consequences of vulnerability factors that may present in hospital and their impact concerning the rehabilitation prognosis are largely unresearched, whereas rehabilitation prognosis is an essential element of referral decision making (Muscat et al., 2022, Verenso, 2013).

To reach a better understanding of vulnerability in association with geriatric rehabilitation outcome we explored usual care data that contained a broad range of vulnerability-associated characteristics. The study aims to contribute to an assessment that is helpful to evaluate the appropriateness of rehabilitation-oriented care and induce a tailored, person-centred rehabilitation program. What are premorbid and incident characteristics of older adults referred to rehabilitation-oriented post-acute care? Which vulnerability associated patient characteristics could inform the course and outcome of rehabilitation trajectories?

Methods

Design

Retrospective cohort study of geriatric rehabilitation patients in the Netherlands. Care trajectories were followed from hospital admission to discharge from rehabilitation.

Participants and setting

In this study we included patients discharged from one large tertiary hospital, between January 15 and May 15, 2019. Inclusion criteria were 1) community living before acute hospital admission and 2) referral to a rehabilitation trajectory in a nursing home at hospital discharge. Liaison nurses, who arrange and coordinate follow-up care for all non-home discharged hospital patients, invited eligible candidates to participate in the study regardless of their age or diagnosis. Incapacity concerning the decision to consent to participation was the only exclusion criterion.

Twenty two nursing homes throughout the country delivered inpatient rehabilitation oriented post-acute care to the participants, consisting of 1) geriatric rehabilitation (GR) or 2) short term recovery care (STRC) or 3) rehabilitation treatment under the Long-term Care Act (LTRC). STRC is short-term supportive nursing home care for patients who temporarily need inpatient medical care, not involving hospital care or geriatric rehabilitation (van den Besselaar et al., 2021). LTRC is long-term care with supplementary multidisciplinary treatment, assigned to patients who are not expected to return home after rehabilitation.

Data collection

Data were retrieved from medical records and concerned five episodes in the care trajectory of the participants: 1. premorbid 'baseline' functioning (pre-H)); 2. hospital admission (HA); 3. hospital discharge, when discharge planning had started and liaison nurses were involved to arrange follow-up care (HD); 4. post-acute care admission (PAC-A) and 5. post-acute care discharge (PAC-D). Table 1 shows an overview of the data, collected in each of these episodes.

Table 1. Data collection during episodes of care

Episode →	Before admission (pre-H)	Hospital admission (HA)	Hospital discharge (HD)	Post-acute care admission (PAC-A)	Post-acute care discharge (PAC-D)
Record →	**Transitional care record**	**Hospital medical record**	**Transitional care record**	**PAC medical record**	**PAC medical record**
Domain ↓					
Demographic					
Age, sex					
Morbidity					
Diagnosis		Main diagnosis		Post-acute path of care	
Comorbidity	Dementia diagnosis	Comorbidities in medical history		Comorbidities Geriatric syndromes[1]	
Complications		Delirium		Complications	
Functional					
Functional status	ADL status	ADL status	ADL status Δ ADL status	ADL status	ADL status Δ ADL status
Mobility	Mobility status Use of walking aids		Mobility status Use of walking aids Δ Mobility	Mobility status Use of walking aids	Mobility status Use of walking aids Δ Mobility
Cognitive					
Cognitive and mental functioning	Cognitive or mental complaints[2]		Cognitive or mental complaints[2] Disease insight	Cognitive or mental complaints[2] Involvement of psychologist	

Table 1. Continued

Episode →	Before admission (pre-H)	Hospital admission (HA)	Hospital discharge (HD)	Post-acute care admission (PAC-A)	Post-acute care discharge (PAC-D)
Record →	**Transitional care record**	**Hospital medical record**	**Transitional care record**	**PAC medical record**	**PAC medical record**
Domain ↓					
Multi-domain					
Vulnerability	Living situation Housing Caregiver(s) Family network	DSMS-vulnerability score.	Vulnerability (observation) Vulnerability (liaison nurse observation) Social vulnerability[3]	Caregiver(s)	Complications during PAC
Case-complexity		Paramedic involvement[4] Consultants[5]	Therapy endurance	Multi-disciplinary team involvement	Follow-up care
Care trajectory			Hospital length of stay		Post-acute care length of Stay Total trajectory length of Stay

ADL=Activities of Daily Living; DOSs= Delirium Observation Screening score; DSMS= Dutch Safety Management System vulnerability score. 1. Hearing or vision impediment, speech impediment, incontinence, dementia. 2. Memory loss, disorientation, behavioral problems, mood problems, delusions. 3. 'neglect', 'wandering or homelessness', 'addiction', 'absence of a social network', 'living alone' and 'having no caregiver' 4. Dietician, physiotherapist, occupational therapist, social worker, speech therapist, nurse specialist. 5. Geriatrician, physiatrist, psychologist.

Data consisted of 1) demographic; 2) morbidity; 3) functional; 4) cognitive and 5) multi-domain variables, following a categorization of triage factors (de Groot et al., 2022). Demographic data, hospital admission diagnosis, comorbidity diagnoses and vulnerability scores were retracted from hospital electronic health records. Two researchers collected the other data from transitional and rehabilitation records. Transitional records contain data, routinely assembled by hospital liaison nurses, the information is relevant in follow-up care decision making at hospital discharge. In this study the transitional record data concerned the functional and cognitive status at hospital discharge as well as the functional status, cognitive complaints, care-dependency, housing, living and informal care in the pre-hospital situation. Rehabilitation records contained data regarding functional status, mobility and cognition during post-acute care, multidisciplinary involvement, length of stay, discharge destination after post-acute care and some characteristics of follow-up care. These data were directly extracted from the rehabilitation records by the researchers or collected via telephone contacts with a physician or nurse specialist in the facility.

Variables and measurement instruments

Comorbidities were defined as chronic conditions, additional to the index rehabilitation condition. Rehabilitation relevant comorbidities were selected from medical history data by the researchers, following the list of diagnoses in the weighted Functional Comorbidity Index (Kabboord et al., 2020). See Additional Material A. Functional status at baseline was reconstructed into a count of dependencies in bathing, dressing, toileting, transferring, continence and feeding, following the Katz-ADL-6 items. In hospital**,** this count was carried out at HA and HD. At PAC-A and PAC-D the functional status was classified as ADL-independent, mildly ADL-dependent (dependent only in bathing and dressing) or ADL-dependent (dependent in more ADL items). Mobility was classified as independent, independent with walking aid or dependent and scored premorbid, at HD, PAC-A and PAC-D.

To quantify cognitive and mental status premorbid and at HD, cognitive symptoms (presence of memory loss, disorientation, delusion, behavioral problems, mood complaints) were summed. During PAC, cognitive status was registered by summing the presence of cognitive or mood symptoms and involvement of a psychologist. At HA, vulnerability was screened in a mandatory vulnerability score (positive/negative) composed out of four screening elements (functional, nutritional, cognitive, fall risk) and age, see Additional Material B.

To quantify a participant's vulnerability, we summed physical, social and psychological items associated with vulnerability (0-16). In this way a conceptual unweighted multi-domain set of items was constructed, following the methodology of the Social Vulnerability Index (SVI) and the Frailty Index (FI), wherein clinically relevant items or deficits are summed to measure the concept (Mah et al., 2023). In the physical vulnerability domain we counted the geriatric syndromes assembled at hospital discharge. The summed

multidomain vulnerability measure consisted of incontinence, obesity, and visual, hearing or speech impairment (0-5) for physical vulnerability and 'neglect', 'wandering', 'substance use disorder', 'absence of a social network', 'living alone' or 'having no caregiver' (0-6) for social vulnerability. Cognitive vulnerability items consisted of 'memory loss', 'disorientation', 'delusion', 'behavioral problems' and 'mood complaints' (0-5). Supplement B shows an overview of the vulnerability associated variables analyzed in this study.

For case complexity, in-hospital consultation of geriatrician, physiatrist or psychologist (0-3) was counted as well as the number of paramedic therapists involved (0-6). Apart from the nurses and the attending physician, the number of therapists involved in the multidisciplinary team during PAC and after discharge from rehabilitation was registered (0-5).

Data analysis

Prehospital, hospital and post-acute care data were merged to individual care trajectories. Participants were categorized according to primary outcome measure 'final discharge destination', defined as 'returned to community living after post-acute care' (Y/N). Missing data were not imputed. Data was analyzed in SPSS 28. Categorical variables were given as percentages. Numeric variables were given as means with SD or median with IQR. Significance was set at 0.05 and tested between groups with χ^2 test for nominal data, Mann-Whitney-U test for ordinal data and t-test for numeric data following normal distribution. Associations were analyzed by comparing frequencies in discharge destination groups. Change in mobility status ($^{\Delta}$ mobility) was computed by comparing mobility classes before HA, at HD and at PAC-D. Change in functional status ($^{\Delta}$ ADL) was computed by comparing ADL- dependency classes before HA, at HD and at PAC-D.

Ethics

The Medical Ethics Committee of the Amsterdam University Medical Centers reviewed and approved the study protocol under file 2018621. Participants were informed verbally and in writing and written informed consent was obtained from all participants.

Results

At hospital discharge 87 patients were referred to inpatient rehabilitation oriented post-acute care. Despite the referral for GR one patient was admitted to long-term care and one went home. The remaining 85 participants transferred to facilities for post-acute care. After arrival, two participants were readmitted to hospital and four were referred to other types of care: long-term care (2), palliative care (1), homecare (1). In addition, the PAC trajectory data of six participants were not found. Altogether these fourteen (2+2+4+6) patients, the 'No PAC-data group' were lost to follow-up concerning their PAC trajectory. Out of 73 remaining participants, 60 (82.2%) started a geriatric rehabilitation trajectory, 11 (15.1%) received short-term residential care (STRC) and 2 (2.7%) were admitted to long-term care with rehabilitation treatment (LTRC).

At PAC-discharge, 60 participants (82.2%) returned to their original living situation; 52 (86.6%) following a GR trajectory, seven (11.7%) after STRC and one (1.7%) after LTRC. Of thirteen non-home discharged participants, one (7.6%) was referred to medical specialist rehabilitation, two (15.4%) were readmitted to hospital, five (38.5%) to long-term care, two (15.4%) received hospice care and three (23.1%) died. See Figure 1.

The mean age of the participants, 76.3 (SD 10.7) years, differed significantly between groups; 73.4 (SD 13.9) years in the 'No PAC-data group', 76.3 (SD 9.3) years in the 'Home after PAC' and 79.7 (SD 13.0) years in the 'non-Home after PAC' group. Sexes were evenly distributed, except for the 'No PAC-data group' (35.7% male). A small majority (59.8%) of participants was living alone before hospital admission. Premorbid 69.0% was independent in ADL and 41.4% in mobility. Table 2 shows the pre-admission characteristics in all PAC-referred participants (N=87) and in three subgroups: 'No PAC-data'(N=14), 'Home after PAC'(N=60) and 'Non-home after PAC'(N=13).

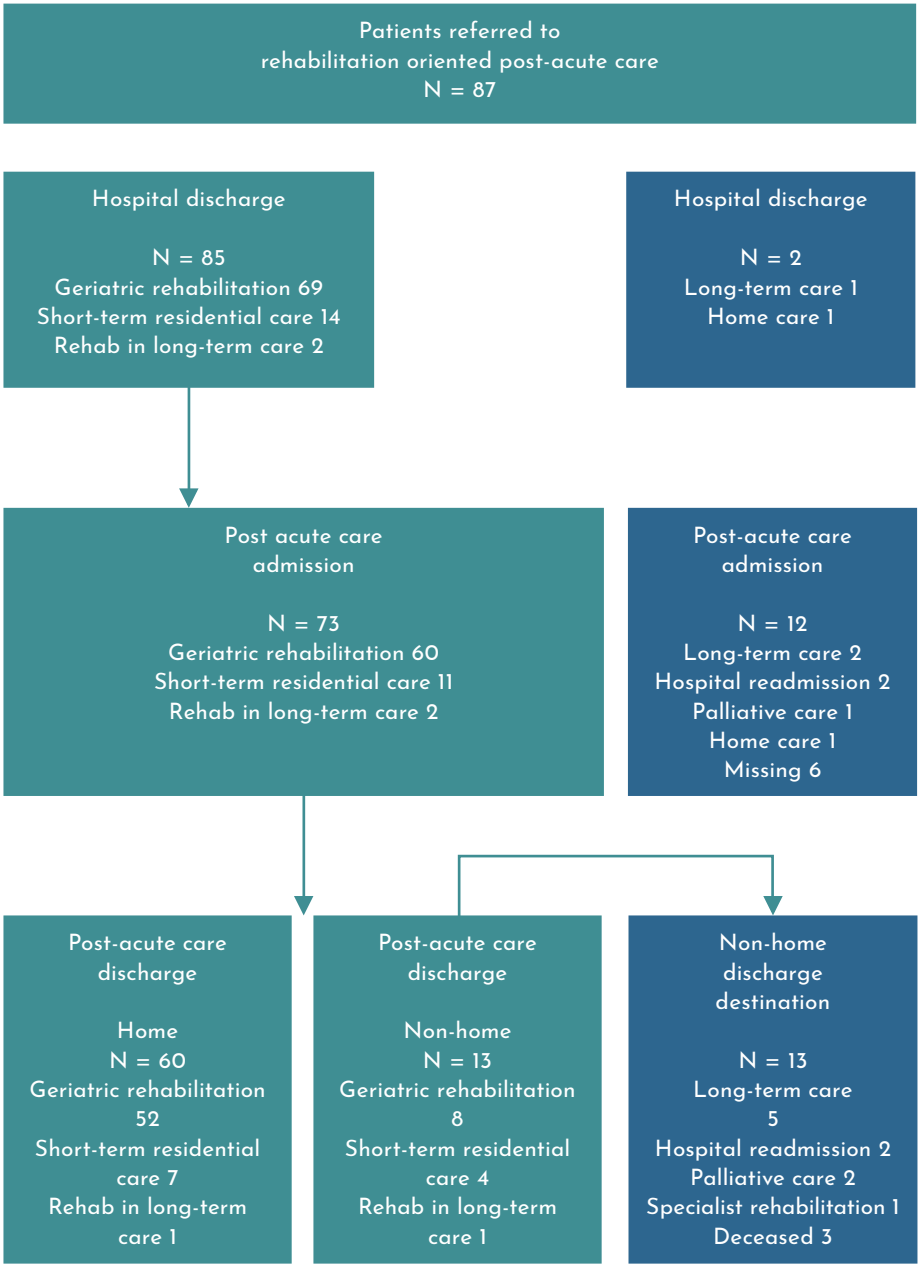

Figure 1. Flow diagram of patients referred to rehabilitation-oriented post-acute care at hospital discharge

Table 2. Premorbid characteristics of all referred patients and for each of the three subgroups

Baseline	Total N=87 (%)	No PAC data1 N=14 (%)	Home after PAC N=60 (%)	Non-home after PAC N=13 (%)	p-value Home vs. Non-home
Sex Male	43 (49.4)	5 (35.7)	31(51.7)	7 (53.8)	0.887
Female	44 (50.6)	9 (64.3)	29(48.3)	6 (46.2)	
Age in years (mean, SD)	76.3 (10.7)	73.4 (13.9)	76.3(9.3)	79.7(13.0)	**0.031**
≤60	7 (8.0)	3 (21.4)	3 (5.0)	1 (7.7)	0.429
61-70	19 (21.8)	4 (28.6)	12 (20.0)	3 (23.1)	
71-80	29 (33.3)	2 (14.3)	24 (40.0)	3 (23.1)	
81-90	24 (27.6)	3 (21.4)	19 (31.7)	2 (15.4)	
>90	8 (9.2)	2 (14.3)	2 (3.3)	4 (30.8)	
Living alone N=84	52 (59.8)	8 (61.5)	34 (57.6)	13 (92.9)	**0.013**
Caregiver N=71	65 (74.7)	11 (78.6)	44 (73.7)	10 (76.9)	0.647
No caregiver	6 (6.9)	0 (0.0)	4 (6.7)	2 (15.4)	
Missing	16 (18.4)	3 (21.4)	12 (20.0)	1 (7.7)	
House with stairs N=71	38 (43.7)	5 (35.7)	27 (52.9)	6 (54.5)	0.923
Independent in ADL N=70	60 (69.0)	7 (50.0)	47 (78.3)	6 (46.2)	0.562
Independent Mobility[2] N=71	36 (41.4)	6 (42.9)	30 (56.6)	0 (0.0)	**<0.001**

PAC=post-acute care. ADL=Activities of daily living. 1. Subgroup of patients without data PAC trajectory. 2. Independent mobility without use of walking aid.

Hospital stay

Table 3 shows the in-hospital data. At hospital admission, fractures (39.1%) were the most frequent main diagnosis, followed by oncological diagnoses (17.2%). Main diagnoses were evenly spread in PAC discharge groups. See Supplement A. The mean number of comorbidities was 5.5 (SD 3.479) in the Non-home group, versus 4.2 (SD 2.464) in patients discharged home.

Table 3. Characteristics of referred patients during the hospital care trajectory

Hospital episode	PAC Referred N=87	No PAC Data N=14	Home after PAC N=60	Non-home after PAC N=13	p-value Home/ Non-home
Main diagnosis, N (%)	20 (23.0)	2 (14.3)	15 (25.0)	3 (23.1)	
Proximal fracture of femur	14 (16.1)	3 (21.4)	9 (15.0)	2 (15.4)	
Other or multiple	15 (17.2)	4 (28.6)	9 (15.0)	3 (23.1)	
fractures	12 (13.8)	2 (14.3)	8 (13.6)	1 (7.7)	
Oncological diagnoses	1 (1.1)	0 (0.0)	1 (1.7)	0 (0.0)	
Benign surgical diagnoses	5 (5.7)	0 (0.0)	4 (1.7)	1 (7.7)	
Amputation	7 (8.0)	0 (0.0)	6 (10.0)	1 (7.7)	
Neurological diagnoses	5 (5.7)	2 (14.3)	3 (5.0)	0 (0.0)	
COPD, pneumonia	8 (9.2)	1 (7.1)	5 (8.3)	2 (15.4)	
Cardiac failure					
Other diagnoses					

Table 3. Continued

Hospital episode	PAC Referred N=87	No PAC Data N=14	Home after PAC N=60	Non-home after PAC N=13		p-value Home/ Non-home
Comorbidities, mean (SD) N=87	3.6 (2.4)	3.2 (1.7)	4.2 (2.5)	5.5 (3.5)	N=73	0.097
Comorbid dementia N=72	1 (1.1)	0 (0.0)	1 (1.7)	0 (0.0)		0.652
ADL count[1], mean (SD) Baseline N=70 At HD N=71	0.26 (0.7) 3.55 (1.4)	0.13 (0.4) 3.63 (1.6)	0.24 (0.7) 3.53 (1.5)	0.38 (0.7) 3.63 (1.6)	N=62 N=63	0.489 0.829
Independent ADL N (%) Baseline N=70 At HD N=71	60 (69.0) 1 (1.1)	7 (50.0) 0 (0.0)	48 (80.0) 1 (1.7)	5 (38.5) 0 (0.0)	N=62 N=63	0.450 0.750
Independent mob.[2] N (%) Baseline N=71 At HD N=69	36 (41.4) 7 (8.1)	6 (42.9) 1 (7.1)	30 (50.0) 6 (10.0)	0 (0.0) 1 (7.7)	N=61 N=63	**0.002** 0.959
Cognition[3], mean(SD) At HA N=69 At HD N=73	0.27 (0.6) 0.38 (0.9)	0.9 (1.1) 1.1 (1.4)	0.17 (0.5) 0.23 (0.6)	0.20 (0.1) 0.40 (0.7)	N=64 N=62	0.804 0.343
Mood complaints N (%) At HA N=74 At HD N=75	3 (3.4) 4 (4.6)	N=10 1 (7.1) 2 (14.3)	N=55 1 (1.8) 2 (3.6)	N=9 1 (11.1) 0 (0.0)	N=64	0.137 0.561
Delirium, N (%) N=70 Delirious at HD Delirious episode	2 (2.3) 14 (16.1)	N=8 1 (12.5) 2 (25.0)	N=53 2 (3.8) 8 (15.1)	N=9 0 (0.0) 3 (33.3)	N=62	0.370
Impaired insight, N (%) N=80 diminished absent	9 (10.3) 4 (4.6)	N=12 3 (21.4) 1 (7.1)	N=58 6 (10.3) 3 (5.2)	N=10 0 (0.0) 0 (0.0)	N=68	0.409
Vulnerable N (%) DSMS N=78 Ward N=74 Liaison nurse N=87	35 (44.9) 52 (70.3) 72 (82.8)		26 (43.3) 35 (58.3) 49 (81.6)	5 (38.5) 9 (69.2) 11 (84.6)	N=65 N=62 N=73	0.643 0.732 0.801
Consultants[4] N (%) N=83	14 (16.9)	3 (25.0)	9 (15.0)	2 (18.2)	N=71	0.676
MD team[5], mean (SD) N=77	1.7 (1.0)	1.6(1.2)	1.7 (1.0)	1.8 (0.9)	N=66	0.417
InH days, med(IQR) N=87	*14 (8-23)*					
Delayed Transfer of Care days, mean (SD) N=79	4.6 (3.5)	3.6 (4.3)	5.1 (3.5)	3.5 (2.2)	N=73	0.369

PAC=post-acute care. No PAC data= subgroup of referred patients without data of PAC trajectory retrieved. ADL=Activities of daily living. Mob.=mobility. DSMS=Dutch Safety Management System. MD=Multidisciplinary. InH=in hospital. 1.Sum of ADL dependencies. 2.Independent without use of walking aid. 3. Summed cognitive complaints: memory loss, disorientation, behavioral problems, delusions (0-4) 4. Involvement of geriatric specialist, rehabilitation specialist or psychologist during hospital stay. 5. Number of therapists involved: dietician, occupational therapist, physiotherapist, social worker, spiritual counselor.

Mean ADL dependency increased from premorbid 0.26 to 3.55 at hospital discharge. The percentage of participants with independent ADL (premorbid 69.0%, 1.1% at HD) or mobility (premorbid 41.4%, 8.1% at HD) decreased. During hospital stay, 16.1% of the participants had been delirious and 2.3% was delirious at HD.

The mean cognitive symptoms count at HD was highest in the No PAC-data group (1.1), as well as the percentage of patients with mood complaints (14.3%). Neither vulnerability screened at hospital admission, nor observed on the ward or at hospital discharge was associated with outcome of rehabilitation. Median duration of hospital stay was 14 days (IQR 8-23), mean number of delayed transfer of care days was 4.6 (SD 3.5).

Rehabilitation

Table 4 shows the post-acute care trajectory data. In the PAC-receiving group (N=73), patients without complications were overrepresented in the home group (68.3%) versus non-home (38.4%). The number of comorbidities did not reach statistical significance between groups. Patients living alone were over-represented in the non-home group (92.2%), versus (57.6%) in the home group. The number of patients without a caregiver changed from six at baseline (source: transitional record) to 34 during post-acute care (source: PAC medical record). Having a caregiver was not associated with PAC discharge destination. Median length of stay in post-acute care was 38.5 days (IQR 24-70); 37 days (IQR 24-65)in the 'home after PAC' group and 68.5 days (IQR 22-108) in the non-home group. The mean number of multidisciplinary team members involved changed from 1.7 in hospital to 3.1 during PAC and 0.5 post-discharge.

Functional status and mobility had decreased at hospital discharge compared to baseline in a majority of participants. Functional status returned to baseline at PAC-D in 37 participants (66.1%, N=56). Mobility was restored to baseline classification in 40 participants (65.6%, N=61). Non-home discharge after PAC was significantly higher in participants not reaching independent mobility, whereas 'independent functional status' did not discriminate between PAC discharge destination groups. Figure 2 shows the change in ADL-and mobility class from baseline to hospital discharge, from PAC admission to PAC discharge and during the entire inpatient care trajectory.

Table 4. Characteristics of patients receiving post-acute care

Post-acute Care	PAC recipients N=73 (%)	Home N=60 (%)	Non home N=13 (%)	p-value
Living alone N=73	47 (64.4)	34 (57.6)	13 (92.9)	**0.013**
No Caregiver N=72	34 (46.6)	30 (50.8)	4 (30.8)	0.189
Type of PAC N=73	60 (82.2)	52 (86.6)	8 (61.5)	0.071
Geriatric rehabilitation	11 (15.0)	7 (11.6)	4 (30.8)	
Short-term residential care	2 (2.7)	1 (1.7)	1 (1.7)	
Long-term care rehabilitation				

Table 4. Continued

Post-acute Care	PAC recipients N=73 (%)	Home N=60 (%)	Non home N=13 (%)	p-value
Path of care N=73				
Trauma	33 (45.2)	26 (44.1)	7 (50.0)	
Amputation	1 (1.4)	1 (1.7)	0 (0.0)	
Stroke	1 (1.4)	0 (0.0)	1 (0.0)	
Mixed diagnoses	38 (52.1)	32 (54.2)	6 (42.9)	
Comorbidities, mean (SD) N=73	4.41 (2.70)	4.17 (2.46)	5,54 (3.48)	0.097
No complications[1] N=68	46 (63.0)	41 (68.3)	5 (38.4)	**0.009**
MD team[2], mean (SD) N=69	3.07 (1.08)	3.05 (1.03)	3.22(1.39)	0.675
Δ ADL class[3] Baseline-PAC-D N=62	1 (1.4)	1 (1.7)	0 (0.0)	
1	45 (61.6)	43 (71.6)	2 (15.4)	
0	15 (20.5)	15 (25.0)	0 (0.0)	
-1	1 (1.4)	0 (0.0)	1 (7.7)	
-2	11 (15.1)	1 (1.7)	10 (76.9)	
missing				
Δ Mobility[4] Baseline-PAC-D N=63	40 (54.8)	38 (63.3)	2 (15.4)	
0	21 (28.8)	20 (33.3)	1 (7.7)	
-1	2 (2.7)	1 (1.7)	1 (7.7)	
-2	10 (13.7)	1 (1.7)	9 (69.2)	
missing				
Cognitive symptoms in PAC N=56	11(19.6)	6 (13.6))	5 (41.7))	**0.032**
Mood problems during PAC N=56	13 (23.2)	10 (16.7)	3 (23.1)	
Psychologist involved N=69	22 (31.9)	17 (28.8)	5 (50.5)	0.184
Social vulnerability[5] mean (SD) N=68	1.3 (0.9)	1.2 (0.8)	2.0 (0.8)	**0.002**
Vulnerability[6] mean (SD) N=51	2.8 (1.6)	2.6 (1.5)	4.0 (1.6)	**0.017**
Length of stay, med (IQR) N=73	38.5 (24-70)	37 (24-65)	68.5(22-108)	0.326
Post-discharge care N=71	54 (76.1)	54 (94.7)		
Homecare	39 (54.9)	39(68.4)		
MD team[2], mean, SD	0.46 (0.651)	0.56 (0.682)		

PAC=post-acute care. MD=Multidisciplinary. ADL=Activities of daily living.
1. Complications were falls, infection, delirium, heart disease. 2. Dietician, occupational therapist, physiotherapist, social worker, spiritual counselor. 3. ADL-dependency classes: independent, dependent only in grooming and dressing, dependent not only in grooming and dressing. 4. Mobility classes: independent, independent with walking aid, dependent. 5. Neglect, wandering, addiction, small social network, living alone, no caregiver summed. 6. DSMS Vulnerability score = sum of presence of incontinence, obesity, visual impairment, hearing impairment, speech impairment (physical vulnerability, 0-5) and neglect, wandering, addiction, small social network, living alone, no caregiver (social vulnerability, 0-6) and memory deficits, orientation deficits, delusions, behavioral problems, mood complaints (cognitive vulnerability, 0-5).

One participant (1.1%) was diagnosed with dementia as a comorbidity, he went home after rehabilitation. In the 'non-home' discharged group, five participants (41.7%) had cognitive complaints, compared to six (13.6%) in the 'home after PAC' group, see Table 4.

The social vulnerability count and the summed vulnerability count were associated with discharge destination after PAC. Supplement B shows detailed vulnerability data.

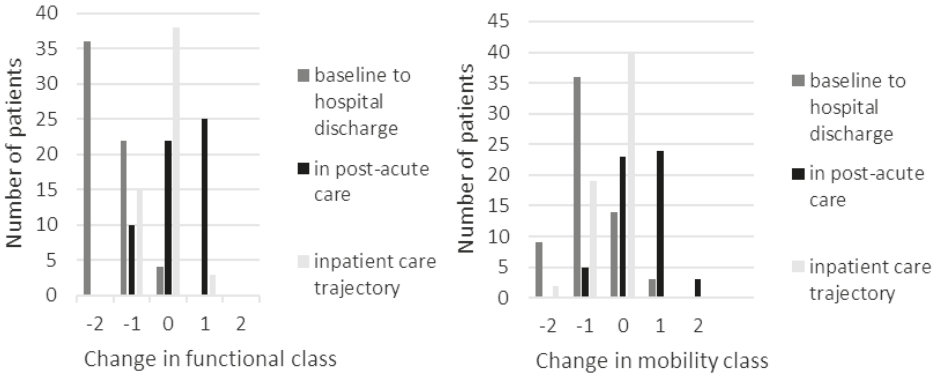

Figure 2. Number of patients and change in functional and mobility class from baseline to hospital discharge, during post-acute care and from baseline to final discharge
Functional classes: independent, dependent in one category of functioning, dependent in more than one category of functioning. Mobility classes: independent, independent with walking aid, dependent.

Discussion

The findings in this study showed the vast case-mix variety concerning age, admission diagnosis, comorbidity count and multi-domain vulnerability components of hospital patients transitioning to rehabilitation oriented post-acute care.

At HD in comparison to baseline functioning, the mean functional dependency score had steeply increased from 0.26 (SD 0.7) to 3.55 (SD 1.4)) and independent mobility decreased from 41.4% to 8.1%. These findings confirmed that 'acute decline in functional status and mobility' was a valid criterion for referral to GR (Corsonello et al., 2022, Pfoh et al., 2020). Independent mobility at baseline was associated with discharge home after rehabilitation and regaining one's premorbid level of functioning, could be a sign of resilience. The majority of participants could overcome the stressors of acute illness and hospital admission (Tillson et al., 2018, Lambe et al., 2022, Gijzel et al., 2019).

The vast case-mix variety also concerned the comorbidity status of referred patients. Although we discarded medical history items that were theoretically unrelated to rehabilitation prognosis, the comorbidity count remained unassociated with the outcome measure 'home discharge after PAC'. Whereas most studies have been inconclusive on the relation between comorbidity measures and rehabilitation effectivity, Kabboord described a modest association between the Weighted Functional Comorbidity Index, assessed

by the attending physician during rehabilitation, and functional rehabilitation outcome (Kabboord et al., 2020, New et al., 2017, Nissan et al., 2022). It seems plausible that, as a referral criterion, the impact of comorbidity on rehabilitation outcome, assessed by an attending physician would add to a mere count of comorbidities in the medical record. Tolley and colleagues found an association between higher scores of the Cumulative Illness Rating Scale and improved frailty severity in a large geriatric rehabilitation cohort. They argued that geriatric rehabilitation would be more effective in patients with severe impact from their comorbidities (Tolley et al., 2022).

In the No PAC-data group, patients with cognitive or mental symptoms were over-represented. Moreover, non-home discharge after PAC was associated with cognitive symptoms or mental complaints during rehabilitation. These findings may suggest that having cognitive or mental symptoms was no barrier for referral, whereas upon admission to geriatric rehabilitation, they were a barrier to be admitted to or to profit from rehabilitation. Cowley and colleagues showed that careful assessment of cognitive vulnerability-associated characteristics was feasible and allowed for adequate hospital discharge planning with older hospital patients (Cowley et al., 2017, Cowley et al., 2022). Consultation of a geriatric rehabilitation expert may be recommended to assist in the transfer of cognitive vulnerable patients ton post-acute care units that would be best equipped to their needs.

In addition to cognitive vulnerability, social vulnerability and the summed score of multidomain vulnerability components were associated with discharge destination after rehabilitation in this study. This result aligns with studies that describe the relationship between social vulnerability and frailty progression in older adults experiencing social isolation (Hanlon et al., 2024, Bunt et al., 2017). In earlier studies, social vulnerability item 'living alone' was associated with adverse outcome 'non-home discharge after GR' (Everink et al., 2016, Lage et al., 2018). Other components of social vulnerability, such as 'small network' or 'inadequate housing' have been relatively unexplored in connection with GR referral and outcome.

Vulnerability assessment

In this study no frailty or vulnerability measurements were available, apart from the mandatory vulnerability screening of older individuals at hospital admission. Vulnerability without further definition was assessed twice, once at the hospital ward and once by liaison nurses in the transitional care record; none of these assessments were related to rehabilitation outcome in this study (Table 3, Additional Material B, Figure 4).

Assessment of vulnerability or frailty in a detailed manner is not prevailing in geriatric rehabilitation decisions. Subsequently evaluation of the course and outcome of rehabilitation trajectories from a perspective of multi-domain vulnerability is rare. From literature and experience we know that family support and social network contribute

substantially to individual outcome in geriatric rehabilitation, as do personal motivation and resilience (Angevaare et al., 2020, Gijzel et al., 2020). Associations between supportive social sources of health, personal motivation and outcome of rehabilitation trajectories seem rather under explored in GR research. We hypothesized that a structured multi-domain vulnerability assessment would contribute to decision making concerning post-acute care. Such a set of vulnerability-based factors could be applied to assess the severeness of individual vulnerability and specify the demands for an appropriate rehabilitation program with individually targeted physical, cognitive and social elements. To this purpose, this exploratory study can be regarded as a pilot. Larger studies on course and outcome of GR trajectories could refine a vulnerability assessment by adding relevant characteristics or discard less essential ones (Gill et al., 2022). More insight in the characteristics of individuals with vulnerability and how they can benefit from rehabilitation oriented care could guide the development of follow-up programs adapted to their needs.

Strengths and limitations

The transitional continuity in the design is a strong aspect of this study; it allowed us to report on care trajectories stretching from acute hospital admission to discharge from rehabilitation oriented post-acute care. In comparison with other studies on rehabilitation results, the detailed patient characteristics in this study add to the knowledge of patients' profiles and care trajectories. Secondly, transitional records proved a valuable source of research data, as they contained comprehensive data on both baseline functioning and health status at hospital discharge. When purposively shared between settings, these transitional data could support continuity of care and inform early care activities in the rehabilitation setting, such as initial goal setting. Thirdly, the rehabilitation data was collected in 21 post-acute care facilities throughout the country, which added to the generalizability of the findings.

This study encountered limitations as well. Liaison nurses hesitated to approach stroke patients and families, confronted with sudden severe disease. This inclusion bias led to an underrepresentation of neurology patients in the study. Secondly, discharge destination after PAC is a general outcome measure. We did not follow-up concerning regained level of participation, self-rated quality of life or health care consumption after discharge. Thirdly, findings need to be interpreted with care due to missing data, small groups and registration variation between settings. Lastly, we could not compare the vulnerability counts with a validated frailty instrument.

Conclusion

To contribute to appropriate post-acute care decisions, this pilot study explored the case-mix characteristics of hospital patients referred for rehabilitation oriented post-acute care. All participants were community living before acute hospital admission. After admission to rehabilitation the care trajectory was redirected in 9.2% of cases. Independent baseline mobility, functional progress and an uncomplicated rehabilitation trajectory were associated with discharge home, whereas a geriatric rehabilitation selective comorbidity count was not. No frailty measure was available. Multidomain vulnerability as a count of physical, psychological and social health problems was associated with rehabilitation outcome. This association between a person's vulnerability and his rehabilitation prognosis could imply that a comprehensive vulnerability assessment by a rehabilitation professional is recommendable. Such cooperation between hospital and rehabilitation professionals supports continuity of care and induces a person-centered rehabilitation program for older individuals with vulnerability.

Key Practice Points

Rehabilitation nurses should promote collecting patient information during hospital stay that can support initial goal setting in rehabilitation trajectories of older adults.

Rehabilitation nurses should observe and assess physical, cognitive and social factors related to vulnerability of older adults.

Expertise of rehabilitation professionals concerning the rehabilitation process of persons with vulnerability can contribute to person-centered referral decision making in hospital.

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Supplemental Files

A. Comorbidity and Main Diagnoses

List of comorbidities in the Weighted Functional Comorbidity Index (Kabboord et al., 2020).

1. Arthritis
2. Osteoporosis and/or fractures
3. Degenerative disc disease
4. COPD, Asthma, emphysema or other pulmonary disease
5. Angina Pectoris
6. Myocardial infarction
7. Heart failure
8. Neurological disease
9. Dementia or neurocognitive disorder
10. Stroke
11. Peripheral vascular disease
12. Diabetes Mellitus I or II
13. Gastrointestinal disease
14. Obesity
15. Depression
16. Anxiety
17. Visual impairment
18. Hearing impairment

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Table 5. Main diagnoses

	All patients N=87 (%)	PAC patients N=73 (%)	No PAC data N=14 (%)
Proximal femur fractures	20 (23.0)	18 (24.7)	2 (14.3)
Other or multiple fractures	14 (16.1)	11 (15.1)	3 (21.4)
Oncological surgery	15 (17.2)	11 (15.1)	4 (28.6)
Other surgery patients	12 (13.8)	10 (13.7)	2 (14.3)
Stroke	2 (2.3)	2 (2.7)	0 (0.0)
Other neurological diseases	3 (3.4)	3 (4.1)	0 (0.0)
Cardiologic patients, heart failure	5 (5.7)	3 (4.1)	2 (14.3)
Pulmonary diagnoses	7 (8.0)	7 (9.6)	0 (0.0)
Amputation	1 (1.1)	1 (1.4)	0 (0.0)
Other diagnoses	8 (9.2)	7 (9.6)	1 ((7.1)

Table 6. Main diagnoses in post-acute care discharge groups

	PAC patients N=73 (%)	Home after PAC N=60 (%)	Non home after PAC N=13 (%)
Proximal femur fractures	18 (24.7)	15 (25.0)	3 (23.1)
Other or multiple fractures	11 (15.1)	9 (15.0)	2 (15.4)
Oncological surgery	11 (15.1)	9 (15.0)	3 (23.1)
Other surgery patients	10 (13.7)	8 (13.3)	1 (7.7)
Stroke	2 (2.7)	1 (1.7)	1 (7.7)
Other neurological diseases	3 (4.1)	3 (5.0)	0 (0.0)
Cardiologic patients, heart failure	3 (4.1)	3 (5.0)	0 (0.0)
Pulmonary diagnoses	7 (9.6)	6 (10.0)	1 (7.7)
Amputation	1 (1.4)	1 (1.7)	0 (0.0)
Other diagnoses	7 (9.6)	5 (8.3)	2 (15.4)

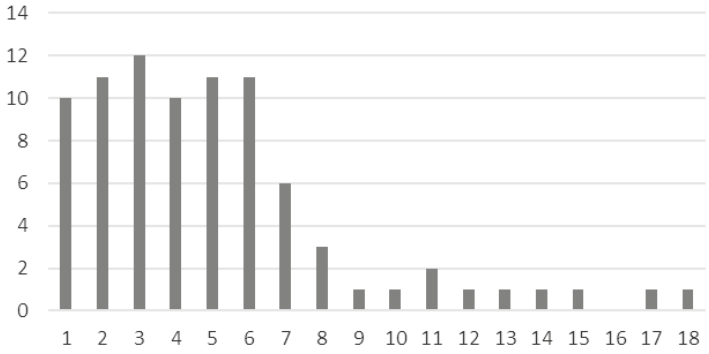

Fig. 3 Patients (N=83) and number of diagnoses

B. Vulnerability

The adapted Dutch safety management system (DSMS) vulnerability score is a mandatory screening applied to all older adults (>70 years of age) admitted to hospital. It was introduced in 2009 to help identify patients in need of targeted geriatric care during their hospital stay.

The score is composed of 'age' (70-79 years/>80 years) combined with scores for functional status (Katz-ADL-6), nutritional status (Short nutritional assessment questionnaire, (SNAq)), risk of falling (Johns Hopkins fall risk assessment tool (JHFRAT)) and delirium symptoms (Delirium Observation Scale (DOSs)).

The original DSMS score (Snijders et al., 2021) contained a screening question for fall risk and three screening questions for symptoms of delirium.

Table 7. The DSMS vulnerability score and the adapted version

	Original DSMS screening	Adapted DSMS screening
Functional status	Katz-ADL ≥2=1 point	Unchanged
Nutritional status	SNAq≥2=1 point	Unchanged
Falls risk	Q: Did you fall during the last 6 months? Yes=1 point	JHRFAT≥6=1 point
Delirium	Q: Do you have memory problems (Y/N); did you need help in basic ADL, in the last 24 hours (Y/N); did you previously experience confusion (Y/N) ≥1 Yes=1 point	DOSs≥3=1 point
DSMS score	0-4 points	Unchanged
Vulnerability	Age<80 and ≥3 points Age≥80 and ≥1 point	Unchanged

DSMS=Dutch short safety management screening. Katz-ADL= Katz activities of daily living score. SNAq=Short nutritional assessment questionnaire. Q=Question. JHRFAT=Johns Hopkins risk of falls assessment tool. DOSs= Delirium observation screening scale.

Snijders BMG, Emmelot-Vonk MH, Souwer ETD et al. Prognostic value of screening instrument based on the Dutch national VMS guidelines for older patients in the emergency department. Eur Geriatr Med. 2021;12(1):143-50.

Table 8. Vulnerability associated items in post-acute care discharge groups

		Home N=55 (%)	Non-home N=9 (%)	p-value
Psychological determinants				
Memory deficits	Before HA	6 (10.9)	1 (11.1)	0.986
Orientation deficits	Before HA	1 (1.8)	1 (11.1)	0.137
Delusions	Before HA	1 (1.8)	0 (0.0)	0.683
Behavioral problems	Before HA	1 (1.8)	0 (0.0)	0.683
Mood complaints	Before HA	1 (1.8)	1 (11.1)	0.137
Memory deficits	At HD	7 (12.7)	2 (22.2)	0.447
Orientation deficits	At HD	2 (3.6)	2 (22.2)	**0.033**
Delusions	At HD	3 (5.7)	0 (0.0)	0.464
Behavioral problems	At HD	1 (1.8)	0 (0.0)	0.683
Mood complaints	At HD	2 (3.6)	0 (0.0)	0.561
		Home N=60 (%)	**Non-home N=13 (%)**	**p-value**
Physical determinants				
Incontinence	At HD	21 (35.0)	8 (61.5)	0.076
Obesity	Before HA	4 (6.7)	0 (0.0)	0.378
Visual impairment	At HD	7 (11.7)	1 (7.7)	0.804
Hearing impairment	At HD	6 (10.0)	1 (7.7)	0.926

Table 8. Continued

		Home N=55 (%)	Non-home N=9 (%)	p-value
Social determinants				
Speech impairment	At HD	1 (1.7)	1 (7.7)	0.228
Neglect (N=71)		3 (5.1)	0 (0.0)	0.425
Wandering (N=71)		0 (0.0)	0 (0.0)	
Addiction (N=70)		1 (1.7)	0 (0.0)	0.647
Small network (N=71)	Before HA	3 (5.1)	3 (25.0)	**0.024**
Living alone (N=73)	Before HA	34 (57.6)	13 (92.9)	**0.013**
No caregiver (N=72)		29 (50.0)	5 (35.7)	0.337
Vulnerability				
DSMS (N=65)	At HA	26 (43.3)	5 (38.5)	0.643
Ward[1] (N=62)	In hospital	35 (58.3)	9 (69.2)	0.732
Liaison nurse[2] (N=73)	At HD	49 (81.6)	11 (84.6)	0.801

HA=Hospital admission, HD= Hospital discharge. DSMS=Dutch Safety Management System.

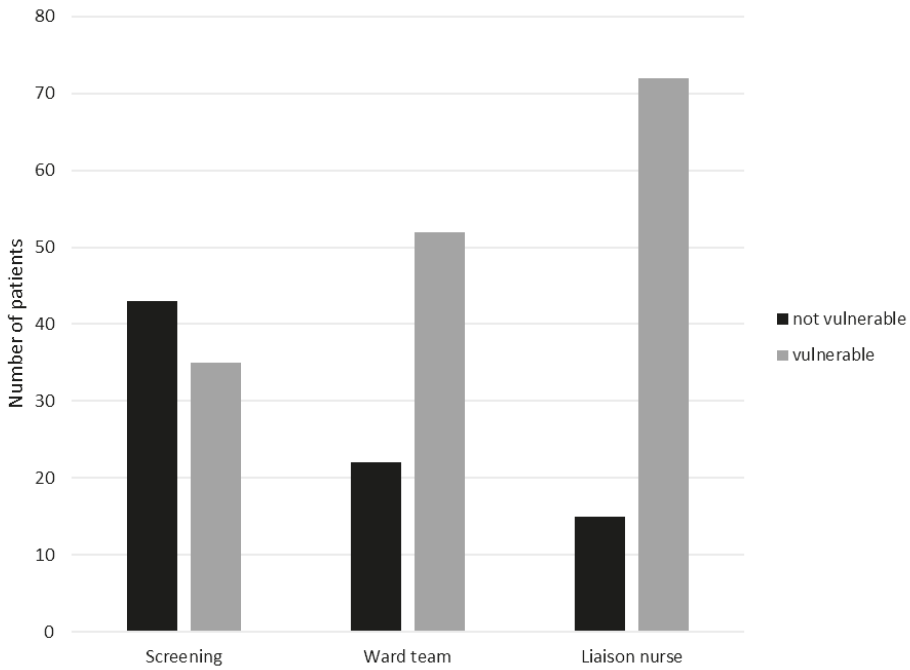

Fig. 4 Number of patients assessed as vulnerable through screening at hospital admission, observation on the ward and by liaison nurses at hospital discharge

CHAPTER 6

CONSENSUS AND CONTROVERSIES ON POST-ACUTE CARE DECISION MAKING AND REFERRAL TO GERIATRIC REHABILITATION: A NATIONAL SURVEY

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Abstract

Background
Transitioning older hospital patients to the appropriate type of post-acute care has become an urgent clinical issue within the context of changing demographics and limited duration of hospital stay.

Objective
Consensus on assessments that guide post-acute care decision making would benefit potential patients and support cooperation between settings.

Design
A national web-based questionnaire focusing on professional contributions, patient involvement and the use of triage items and measures.

Participants
Hospital and geriatric rehabilitation professionals in the Netherlands participated as respondent groups, representing 'sending' and 'receiving' professionals.

Methods
A comprehensive questionnaire was used with open, multiple choice and closed questions, exploring in detail how assessment of hospital patients in need of a post-acute care decision was performed. Descriptive statistics were applied together with deductive coding of qualitative data.

Results
A total of 104 hospital liaison nurses (66.7%) and 52 GR professionals (33.3%) participated. Respondents were reasonably satisfied with the current triage practice. Hospital liaison nurses valued their operational responsibility for triage. Geriatric rehabilitation professionals wanted active involvement in decision making and deemed hospital paramedic expertise sub-optimally applied. 'Too little involvement' of patients and families was felt by 50.0% of the GR respondents versus 15.5% of hospital respondents. The importance of half (47.8%) of the triage items was rated differently between respondent groups. When discussing complex cases between sending and receiving professionals, views were felt as complementary.

Conclusions
Both sending and receiving professionals expressed moderate satisfaction with post-acute care decision making, whereas their views on triage assessments differed according to setting and role. The patients' voice may be insufficiently heard in triage decisions. Shared expertise and a consensual approach can develop when triage consultation is facilitated by both hospitals and PAC facilities. This study offers ingredients to reach a multi-professional view on post-acute care decision making and referral to geriatric rehabilitation.

Introduction

In older and vulnerable patients hospitalization is frequently accompanied by functional decline, which complicates returning home (Falk Erhag et al., 2023, Lin et al., 2016). Inspired by the policy of 'aging in place' and fortified by restrictions on duration of hospital stay, short-term post-acute care services have developed to support patients in overcoming these problems (van den Besselaar et al., 2021, Galvin et al., 2017, Murmann et al., 2023). In 2019, 15-25% of hospital discharges of older patients in the US resulted in transfer to a rehabilitation or skilled nursing facility (Werner et al., 2021). In view of the growing number of older and very old patients, decision making concerning the transitioning of older hospital patients to the most appropriate type of post-acute care has become an urgent issue with underlying societal and ethical dilemmas that reflect the tensions between individual benefits of post-acute care and societal costs (Najem et al., 2018).

Post-acute care (PAC) implies a spectrum of short stay medical and skilled nursing services for older and/or frail patients who require a higher level of care than can be provided at home or in long-term care settings. Geriatric rehabilitation (GR) is an often deployed, effective PAC service aimed at rebuilding self-supportiveness in relation to personal and achievable goals, through integrated multidisciplinary care (Grund et al., 2020). In European countries the availability of GR varied from 0-70 beds per 100.000 inhabitants; 53.300 patients received GR in 2019 in the Netherlands. GR can be necessary after a stroke, hip-fracture or other trauma surgery, orthopedic surgery, vascular surgery, such as amputations, and a variety of internal medical illnesses, such as grave episodes of pulmonary and cardiovascular disease or deconditioning after critical illness. The ultimate goal of geriatric rehabilitation is a safe and preferably longstanding return to community living, albeit adapted to irreversible functional loss.

Based on core determinants of rehabilitation, such as functional prognosis, physical needs and mental capacity necessary to partake in treatment, triage procedures were developed. These included 'motivation to undertake a rehabilitation trajectory' and 'readiness for discharge from hospital specialist care' as building blocks to make proper referral decisions (Galvin et al., 2017, Muscat et al., 2022, Cowley et al., 2021). In practice however, when patient complexity increases, transitional problems could arise, such as inadequate transfer of medical background information, insufficient knowledge of care in the next setting and communicational barriers (Lockwood and Mabire, 2020). Both hospitals and GR-facilities recognized the stressing financial aspects that could compromise the quality of patient centered transitional care (Britton et al., 2017, Lawrence et al., 2020). Based on patient and family interviews in which decision making was evaluated, Burke and colleagues concluded that quality improvement of the decision making process is essential for both patients and professionals (Burke et al., 2018). In view of the aforementioned challenges in transitional care we wanted to study the clinical methods of decision making concerning referral to geriatric rehabilitation in more detail

than previous studies. Which clinical criteria were applied in these decisions and how did professionals cooperate to perform this task?

This study explored the perspectives of both hospital and rehabilitation professionals on methods in post-acute care decision making concerning GR in the Netherlands, aiming to work towards interprofessional consensus on referral to geriatric rehabilitation.

Methods

Design

This is an explorative cross-sectional survey with quantitative and qualitative data. it. The CROSS reference list was used to report the findings (Sharma et al., 2021).

Questionnaire

Figure 1. shows a triage model consisting of three steps in post-acute care decision making, based on the Verenso triage model (Verenso, 2013). The first step concerns the deliberation that discharge home is expected to be unsafe as further care needs are present. The second step is the assessment of the patient's post-hospital care needs, prognosis and preferences concerning post-acute care, resulting in a post-acute care (PAC) decision. The third step is the actual arrangement of placement in rehabilitative or other post-acute care.

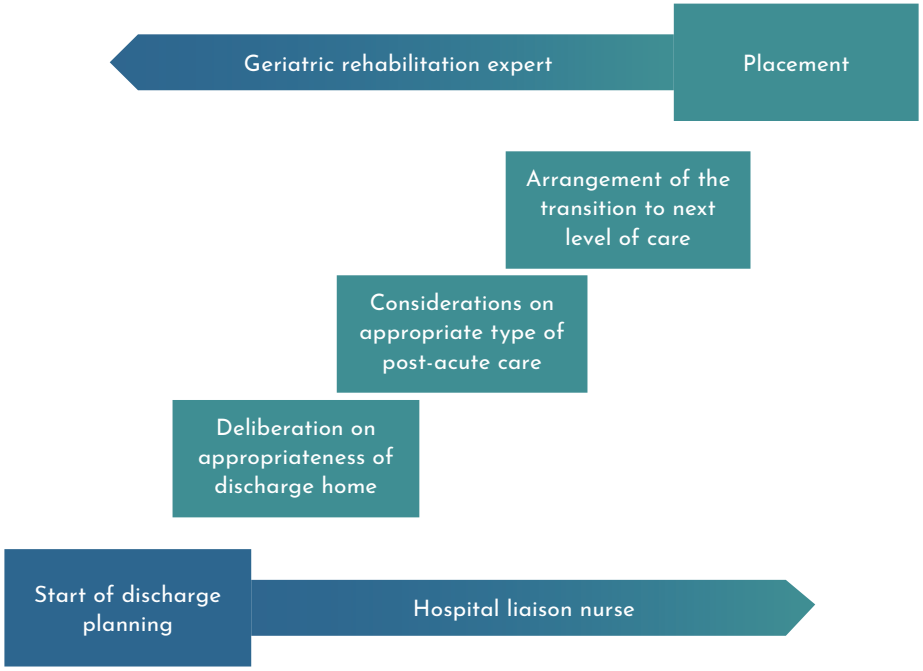

Figure 1. Three steps in post-acute care decision making

Questions were developed based on international literature concerning referral to GR and national pilot survey's on triage (Muscat et al., 2022), (de Groot et al., 2022, Bowles et al., 2009, Cowley et al., 2022). An experienced staff liaison nurse commented on the concept versions.

A combination of closed, multiple choice, open and semi open questions was used. Respondents' views were explored using Likert-scales. Grading of respondents' satisfaction with aspects of triage was explored using a scale of 1 (very inadequate) to 10 (excellent). Definitions of all concepts were provided to ensure adequate content validity. The final version was piloted in 'thinking aloud' telephone sessions, with three liaison nurses and three rehabilitation professionals.

The survey consisted of four parts. The first section explored participants' background and working experience. The second addressed the involvement of professionals, patients and family in triage decision making. The third captured the triage methods, exploring participants' considerations on the importance of triage items that underlie decision making. Examples of measurement instruments were given to grade their use. The final section concerned overarching organizational aspects of the triage process. Completion of the questionnaire was expected to take 15 to 20 minutes. See Supplement 1

Recruitment

The survey was distributed among hospital liaison nurses, who coordinate post-acute care placement and among elderly care physicians, specialist nurses and physician assistants working at geriatric rehabilitation departments of nursing facilities. Liaison nurses were contacted in person via the professional association of nurses in the Netherlands (V&VN) (N=200) and via e-mail to the transfer agencies of all Dutch hospitals. A mailing list of transfer agencies was used and the missing hospitals were contacted by telephone. Elderly care physicians, specialized in GR (N=120) were contacted via their professional association (Verenso) and asked to invite GR-nurse specialists and GR-physician assistants to participate. Both liaison nurses and GR professionals were encouraged to invite colleagues working in other hospitals or GR facilities to participate as well. Potential respondents received a reminder two weeks after the first distribution.

Data collection

The survey was distributed using the tool Survalyzer Essential (Zurich, Switzerland) via a web-based link, that could be used from October 13 till November 26, 2020. To guarantee adequate participant selection, the first part of the survey contained a selection procedure for enrollment.

Data analysis

We grouped respondents according to professional background and setting, being either a liaison nurse (LN) in a hospital or a rehabilitation professional in a geriatric rehabilitation (GR) setting.

Nominal variables were presented in frequencies. Ordinal and scale variables, including the Likert items and scales, were presented in frequencies for 3 or 4-point scales and with means for 5-point scales (Harpe, 2015). Data on triage criteria were listed in domains: 'somatic', 'functional', 'psychologic', 'social' and 'communication' following the SAMPC model to assess care needs and set goals in medical care for older patients (Hertogh, 1997).

We used a pragmatic thematic approach in the analysis of the qualitative data concerning professional responsibilities, patient involvement, triage criteria and evaluation of the triage process. Starting with the questions' subject as a theme, one researcher (XX) categorized the data in subthemes and discussed them with a second researcher (YY).

Significance was set at 0.05. Independent sample T-test or Mann-Whitney U test were used for intergroup comparison. Statistical analysis was done by IBM SPSS statistics version 28.

Ethics

This survey was exempted from institutional review board approval as it did not involve patients or medical data. The study was performed in line with the principles of the Helsinki declaration (World Medical Association). Data was stored in compliance with the General Data Protection Regulation. Respondents were informed concerning the aim of the study and the voluntariness of their participation. Answering and returning the questionnaire was considered informed consent to participate in this study.

Results

Respondents

A total of 156 respondents participated, 102 (67%) were hospital liaison nurses and 54 (33%) GR professionals. This response represented 52% of registered liaison nurses and 47% of registered GR experts. All respondents were experienced in conducting triage and handled an average of 5-15 cases weekly. Table 1 shows information concerning the participants. The majority of liaison nurses (85.6%) worked in regional or district hospitals and performed triage for multiple specialisms, such as neurology, orthopedic or trauma surgery and oncology. One third (32.6%) of the GR respondents was employed in large GR facilities, 40.4% in facilities with 30-60 GR beds and 26.9% in smaller facilities. The facilities concerned provided in GR for several diagnostic target groups, in other types

of post-acute care and in long term care. Additional background information concerning the GR respondents is in Supplement 2.

Table 1. Setting and working experience of respondents

	Liaison nurses (%) N=104 (66.6)	GR professionals (%) N=52 (33.3)
Age (years)		
21-30	4 (3.8)	3 (5.8)
31-40	18 (17.3)	13 (25.0)
41-50	31 (29.8)	13 (25.0)
51-60	39 (37.5)	21 (40.4)
>60	12 (11.5)	2 (3.8)
Region		
Urban area	54 (51.9)	14 (26.9)
Smaller city	29 (27.9)	31 (59.6)
Rural	21 (20.2)	7 (13.5)
Hospital		
Academic	15 (14.4)	
District	36(34.6)	
Regional	53 (51.0)	
GR facility		
>60 places GR		17 (32.6)
30-60 places GR		21 (40.4)
<30 places GR		14 (26.9)
Work experience (years)		
< 5	21 (13.5)	12 (23.1)
6-15	26 (16.7)	10 (19.2)
>15	57 (36.5)	30 (57.7)
Triage experience (months)		
<6	5 (4.8)	2 (3.8)
6-12	4 (3.8)	4 (2.6)
>12	95 (91.3)	46 (88.5)
Triage caseload (cases/week)		
<5	18 (17.3)	8 (15.4)
5-15	62 (59.6)	35 (67.3)
>15	24 (23.1)	9 (17.3)

Professional involvement

Team nurses, residents and liaison nurses contributed most to the first step of decision making, 'deliberating non-home discharge'. The liaison nurses were considered 'most influential' at this point. Although the majority of respondents regarded the impact of all involved professionals 'adequate', a quarter (29.5%) of GR respondents reported 'insufficient input of the resident'. Other hospital professionals, such as geriatricians, psychiatrists, physiatrists, dieticians, or speech therapists were asked to contribute 'on

demand'. A community nurse, general practitioner or the dementia case-manager, familiar with the patient's situation at home, would occasionally be involved sharing extra background information.

Concerning the assessments and deliberations on appropriate follow-up care liaison nurses contributed most. Almost a third of GR respondents felt that the contribution of physiotherapists (25.0%) and occupational therapists (31.8%) on the decision was 'not enough' in this step, versus 4.4% and 5.6% of liaison nurse respondents. Concerning their own contribution, the opinions of GR respondents and liaison nurses differed as well. More GR respondents (40.9%) than liaison nurses (7.8%) felt that the GR specialist had insufficient impact, a minority of liaison nurses (11.1%) and GR respondents (2.3%) thought liaison nurses had insufficient impact. If they were involved, the impact of physiatrists and GR-specialists on the decision was felt as 'substantial'. Table 2 shows the opinions of the respondents about each professionals' contribution. Supplement 3 shows the ratings on professional involvement in triage and qualitative data on professional contributions.

Table 2. Measure of professional contribution to post-acute care decision making

Professional contribution	too little N(%)	adequate N(%)	too much N(%)	p- value (Mann-Whitney U test)
Team nurse				
LN (N=90)	13 (14.4)	76 (84.4)	1 (1.1)	0.062
GR (N=44)	12 (27.3)	32 (72.5)	0 (0.0)	
Team manager				
LN	8 (8.9)	79 (87.8)	3 (3.3)	0.378
GR	6 (13.6)	37 (84.1)	1 (2.3)	
Liaison nurse				
LN	10 (11.1)	78 (86.7)	2 (2.2)	0.002
GR	1 (2.3)	36 (81.8)	7 (15.9)	
Physiotherapist				
LN	4 (4.4)	85 (94.4)	1 (1.1)	<0.001
GR	11 (25.0)	33 (75.0)	0 (0.0)	
Occ. Therapist				
LN	5 (5.6)	84 (93.3)	1 (1.1)	<0.001
GR	14 (31.8)	30 (68.2)	0 (0.0)	
Resident				
LN	9 (10.0)	71 (78.9)	10 (11.1)	0.010
GR	13 (29.5)	28 (63.6)	3 (6.8)	
Med. Specialist				
LN	11 (12.2)	72 (80.0)	7 (7.8)	0.415
GR	10 (22.7)	29 (65.9)	5 (11.4)	
Physiatrist				
LN	5 (5.6)	84 (93.3)	1 (1.1)	0.089
GR	4 (9.1)	33 (75.0)	7 (15.9)	

Table 2. Continued

Professional contribution	too little N(%)	adequate N(%)	too much N(%)	p- value (Mann-Whitney U test)
GR expert				
LN	7 (7.8)	66 (73.3)	17 (18.9)	<0.001
GR	18 (40.9)	26 (59.1)	0 (0.0)	

LN=Liaison nurse respondents. GR= Geriatric rehabilitation respondents.

In step 3, transfer to a PAC facility, three quarters of respondents (71.6% (LN), 69.8% (GR)) answered that a PAC decision could alter, although they were almost unanimous (90.3%) that this 'seldom' occurred. They attributed such a late change primarily (81%) to 'disagreement of the GR facility with the triage decision'. Other reasons were: 'complex nursing or specialized paramedic care not available in the facility', 'long waiting list' and 'altered medical situation during waiting days'. Qualitative material yielded additional reasons, such as 'too early onset of hospital discharge planning', 'the patient appears to need long term care' and 'the family disagrees with the facility'.

Patients and family

Half of the respondents (55.8%) thought that patients and families were informed 'most of the time' when non-home discharge from hospital was considered, a third (37.8%) answered 'always'. This information was shared 'when discharge was near' (65% of respondents) versus 11.2% 'at hospital admission' and 23.9% who said 'I don't know'. The mean appraisal for the timing of this communication (1(bad timing) -10 (excellent timing) was 6.4 by liaison nurse respondents and 6.3 by GR professionals.

Liaison nurse and GR respondents felt differently concerning the impact of patients and families in post-acute care decision making. Half (50.0%) of the GR respondents versus 15.5% of liaison nurse respondents felt that the patients contributed 'too little'; most liaison nurse respondents (79.6%) answered 'sufficient influence'. They judged the family's contribution 'sufficient' (72.3%) or 'too much' (14.9%), whereas half of GR respondents (51.1%) rated the family's influence as 'too little'.

Concerning the contribution of the patient, specifically on choice of placement, liaison nurses responded in 13.6% 'not much', 34.1% 'quite some' and 21.6% 'much influence ; 29.5% choose 'it depends on the situation'. Respondents added 'patients and families are invited to give their preferences concerning placement options' and 'pressure on hospital discharge frequently overrules their choices'.

Triage items

The importance of 11 out of 23 triage items was significantly differently rated by respondent groups. Liaison nurses rated ADL domain items highest. 'In- hospital mobility loss and/or risk of falling' and 'in-hospital functional decline' were deemed very important

by them. Both respondent groups assessed 'no in-hospital recovery' and 'expected recovery' as very important or decisive. GR respondents rated the psychological domain items highest. In both groups 'Impaired comprehension of instruction' was felt important. Societal domain items were higher rated by GR respondents compared to liaison nurses. Table 3 shows the ratings of items.

Table 3. Domains and ratings of triage items

	Liaison nurses N=83 (mean)	GR specialists N=42 (mean)	p-value
Somatical items			
Medication >2 times a day	1.99	1.64	0.064
Multiple chronical conditions	3.37	2.69	<0.001
Incontinence	1.71	1.69	0.897
Pressure ulcer (InH)	2.65	2.52	0.515
Poor nutritional status	2.90	2.60	0.092
Complications (InH)	3.22	2.76	0.005
Vulnerability	3.30	3.21	0.626
ADL items			
ADL limitation or home-care twice a day (PreH)	2.93	3.33	0.014
Mobility loss and risk of falling (InH)	3.95	2.95	<0.001
Functional decline (InH)	3.53	3.19	0.046
Course of previous recovery	2.96	3.12	0.354
No recovery (InH)	3.35	3.14	0.145
Expected recovery (PostH)	4.08	3.74	0.012
Social items			
Living alone	2.67	2.95	0.137
Follow-up care at own request	2.19	3.31	<0.001
Staircase at home	2.29	2.69	0.043
Psychological items			
Previous psychiatric condition or addiction	3.11	3.50	0.024
Impaired comprehension of instructions	3.78	3.88	0.463
Impaired awareness of illness	3.25	3.45	0.221
Delirium (InH)	3.55	3.10	0.004
Anxiety/depression	2.89	2,83	0.707
Communicational items			
Severe visual or hearing impairment	3.13	3.05	0.583
Other items			
Age	2.73	1.88	<0.001

ADL=Activities of daily living. InH= In hospital, during hospital stay. PostH=after hospital stay. PreH= before hospital admission. Grading scale: (1) unimportant, (2) somewhat important, (3) important, (4) very important, (5) decisive.
p-value by ANOVA

In addition other triage items were mentioned, such as 'expectations and wishes of patient and family', 'attitude and motivation concerning GR', 'detailed information from community healthcare workers on functional status and participation before hospital admission', 'rehabilitation goals', 'information from the attending specialist on prognosis' and 'patients' exercise tolerance'.

Measurement instruments

To support post-acute care decisions, instruments for delirium and cognitive status were frequently used, for depression and caregiver burden seldom. Respondents differed significantly in their reports on use of measurement instruments for delirium. See Table 4.

Table 4. Use of measurement instruments to support post-acute care decisions

	Liaison nurses N=83 (%)	GR N=42 (%)	Liaison nurses N=83 (%)	GR N=42 (%)	Liaison nurses N=83 (%)	GR N=42 (%)	Liaison nurses N=83 (%)	GR N=42 (%)	p-value Mann-Whitney U test
	NEVER		OCCASIONALLY		OFTEN		ALWAYS		
Functional status	13 (15.7)	3 (7.1)	30 (36.1)	21 (50.0)	29 (34.9)	10 (23.8)	11 (13.3)	8 (19.0)	0.743
Nutritional status	17 (20.5)	10 (23.8)	26 (31.3)	19 (45.2)	31 (37.3)	7 (16.7)	9 (10.8)	6 (14.3)	0.256
Delirium	0 (0.0)	2 (4.8)	11 (13.3)	17 (40.5)	52 (62.7)	21 (50.0)	20 (24.1)	2 (4.8)	<0.001
Cognitive status	5 (6.0)	3 (7.1)	29 (34.9)	21 (50.0)	42 (50.6)	14 (33.3)	7 (8.4)	4 (9.5)	0.176
Depression	46 (55.4)	17 (40.5)	31 (37.3)	22 (52.4)	6 (7.2)	3 (7.1)	0 (0.0)	0 (0.0)	0.158
Frailty	40 (48.2)	25 (59.5)	27 (32.5)	15 (35.7)	12 (14.5)	2 (4.8)	4 (4.8)	0 (0.0)	0.089
Mobility	39 (47.0)	19 (45.2)	16 (19.3)	18 (42.9)	20 (24.1)	4 (9.5)	8 (9.6)	1 (2.4)	0.294
Caregiver burden	56 (67.5)	28 (66.7)	18 (21.7)	14 (33.3)	9 (10.8)	0 (0.0)	0 (0.0)	0 (0.0)	0.756

Measurement instruments given as an example: Rankin, Katz-ADL, Barthel Index, Short Nutritional Assessment Score, Timed Up and Go, walking speed, Mini Mental State Examination, Montreal Cognitive Assessment, Delirium Observation Scale score, Geriatric Depression Scale, Hospital Anxiety and Depression Scale, Clinical Frailty Scale, Caregiver Strain Index

Other ADL and mobility instruments respondents mentioned, were instrumental ADL scales, the functional ambulation classification scale (FAC) and the Berg balance scale (BBS). The Identification of seniors at risk score (ISAR) and the Short Dutch Safety Management score (SDSM-vulnerability) were alternative vulnerability measures.

Instruments concerning additional triage-relevant clinical domains were the MRC scale for muscle strength and the visual analogous scale for pain (VAS). A majority of GR specialists (58.9%) versus a minority of liaison nurses (28.9%) thought that use of measurement instruments to support PAC decision making was too limited.

Cooperation between settings

A GR expert was involved 'in all triage decisions' (67.7%), 'only in complex cases'(16.1%) or 'only in designated patient groups'(8.6%), such as oncologic or neurologic patients and patients with delirium. Half of respondents (49.6%) consulted a staff member of the follow-up setting, a minority (21.4%) consulted an 'independent' GR expert. Mean appreciation of the GR contribution was 7.11 (1-10, most insufficient-excellent). Qualitative data showed that a joint deliberation between liaison nurse and GR expert was 'valuable' and 'contributing to shared decision making'.

Case conferences on discharge destination and follow-up care were regularly held in neurology departments (85.4%) and to a lesser extent in geriatric (52.4%), internal medicine (51.2%) and oncology departments (42.7%). In a quarter (23.9%) of these conferences, external professionals, such as GR experts were members. Respondents, familiar with these extended case conferences (N=21), were content with them, mean 7.0 (SD 1.3) on a scale from 1 to 10.

Triage responsibility

Three quarters of GR respondents (73.8%) versus 39.8% of liaison nurse respondents considered the GR physician or physiatrist responsible for triage decisions. A quarter of liaison nurse respondents (26.5%) felt this responsibility was theirs. Few respondents (liaison nurses 12.0%, GR 14.3%) held the multidisciplinary team or the resident responsible (liaison nurses 9.6%, GR 4.8%). Respondents were 'almost always' content with the triage decision (liaison nurses: 94.0%, GR: 97.6%) and 'fairly content' with their own role in triage; liaison nurses graded theirs 7.6 and GR specialists 6.9. on a scale from 1 to 10 (very discontent-very content)

Disagreement on triage decisions was not often reported back to the referring party and structural feedback on percentages of successful GR trajectories was rare. Suggestions for improvements concerned the exchange of information, the use of triage forms, discharge preparation in hospital, communication with patient and family, and 'time to perform triage carefully'. An overview is in Appendix 4.

Discussion

This study was performed to gain insight in the multi-professional contributions constituting a referral to geriatric rehabilitation in the Netherlands. We found moderate satisfaction with the triage process and fairly good satisfaction with triage decisions in

both hospital and GR professionals. Professional contributions and triage methods were evaluated slightly different by 'sending' and 'receiving' professionals.

Both liaison nurses and GR professionals felt responsible for the diligence of triage decisions. Liaison nurses felt equipped to take operational responsibility for PAC decision making, whereas GR professionals wished for earlier involvement and opportunities to discuss discharge decisions of complex patients with residents, nurses and paramedic professionals. Taking multi-professional triage decisions in case conferences was valued by both respondent groups. Satisfaction of GR-professionals diminished when involvement occurred only in the last step of triage, 'placement', where they had to confirm or review a decision to enable or refuse transition of the patient to the PAC facility. This kind of 'consultation' was felt as prompted by the accountability of PAC-facilities for rehabilitation outcome (Lawrence et al., 2020, Pereira et al., 2023). Professionally, GR consultants would feel a need for detailed medical and paramedical information to deliberate whether a patient could indeed profit from a GR trajectory as the appropriate type of PAC. Concerning this, Wade and colleagues wrote: "whether the person's needs would appropriately fit the profile of rehabilitation care should not be the central triage question". Instead they plead to ponder "if this service has the best competences to meet this patient's needs compared with other available services" (Wade, 2022). In a Maltese Delphi study on access criteria for GR, experts felt that clinical complexity and vulnerability of GR-referred patients would often hinder an adequate prediction of rehabilitation outcome (Muscat et al., 2022). Care needs of geriatric patients do not always fit into 'appropriate' post-acute care options and their functional prognosis is seldom unambiguous.

Triage

Between respondent groups, the ratings of triage items differed. Formal criteria for admission to geriatric rehabilitation, such as 'being a geriatric patient' characterized by age, multimorbidity or geriatric syndromes were items higher graded by hospital respondents. 'In hospital functional decline' and 'expectation that recovery can be achieved' was highly rated by both respondent groups. These items determine the actual need for rehabilitation treatment, whereas psychological triage items 'impaired disease insight' and 'impaired comprehension of instructions' relate to the mental competences necessary to benefit from it. The ADL-item 'functional level before hospital admission' that influences goal setting in rehabilitation received high ratings as well (Wattel et al., 2023, Bouwstra et al., 2017).

Social domain items, higher rated by GR-respondents, concern the likelihood of a patients' return to the community after the rehabilitation trajectory. 'Follow-up care at own request' may indicate an overloaded situation that jeopardizes a return to community living; 'staircase at home' relates to the functional status necessary to return home. Different judgement of triage items, can be understood from setting and role

of respondents: hospital professionals seem focused on proper placement and GR professionals on outcome of the trajectory. When a patients' case is discussed, however, these complementary perspectives reinforce each other to the advantage of patient centered decisions.

When referral to GR is considered, careful assessment of preferences and motivation of the older patient is recommended (de Groot et al., 2022). This survey explored if and when patients and family were informed that post-acute care decisions were to be made. Respondents agreed in a medium appraisal for this timing (6.4) expressing that involvement of patient and family had occurred quite late in the process. More GR than hospital respondents felt that the families' contribution had not informed the decision. This finding aligns with the study of Gadbois et al. who described that post-acute care placement concerns vulnerable patients and occurs in a hasty fashion. Often information on the options of choice is absent and caregivers select a facility primarily based on its location (Gadbois et al., 2017). Although older and vulnerable patients can prefer not to be involved in medical decision making, assessment of their motivation to partake in a rehabilitation trajectory is a core aspect of triage (Hardicre et al., 2021).

Limitations

The questionnaire was comprehensive and time-consuming for participants. Feasibility and validity of the instrument were not tested. The survey was distributed via professional associations and participants were encouraged to ask their colleagues to participate as well. This may have introduced information bias, as institutions or regions may have been over- or underrepresented.

Finally, this survey was conducted within the boundaries of one country with its healthcare system. Other regulations concerning patients' access to geriatric rehabilitation may implicate other professional triagist roles.

Strengths

Both 'sending' and 'receiving' professionals were equally well represented, constituting a representative group of well-informed respondents.

By applying mixed methods of questioning on a large array of triage related subjects, rich data came available. Respondents answered comprehensively to the questions, showing dedication to the subject.

Recommendations

Discussion in multi-professional focus groups can further enhance interpretation of the results. Geriatricians, physiotherapists and occupational therapists that contribute frequently to triage decisions would add valuable insights. The differences and similarities

underlying triage practice can serve as a starting point for professional consensus and development of triage guidelines.

Shared expertise on post-acute care decisions develops when triage consultation is facilitated by hospitals and PAC facilities. Exchanging the outcome of geriatric rehabilitation trajectories quarterly between hospital and PAC settings gives common ground to these referrals.

Conclusion and implications

Liaison nurses and geriatric rehabilitation professionals express moderate satisfaction concerning the triage process and their professional contribution to it. Both feel responsible for adequate triage decisions. Liaison nurses feel equipped for operational responsibility, GR experts wish for more comprehensive involvement in complex cases. They deem multidisciplinary contributions in triage sub-optimal and the voice of patients and families insufficiently heard in the decision. Respondent groups judged triage items differently, but consented that multidisciplinary patient conferences were valuable. Further exploration of similarities and differences between hospital and geriatric rehabilitation professionals can lead the way to consensus concerning triage.

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Supplemental Material

Supplement 1. Questionnaire

Composition
The first section explores the participants' background and working experience.

The second part addresses the involvement of professionals, patients and family in the three phases of triage decision making.

The third section captures the participants' considerations on the importance of triage items that underlie decision making and the use of measurement instruments for purposes of triage.

In the fourth section of the questionnaire participants were asked to share their views on overarching organizational aspects of the triage process.

I. Background of respondents
(only hospital liaison nurses)

Q3. What type of hospital do you work in?
Q4. In what kind of region is your hospital situated?
Q5. What is your age?
Q6. How many years of practice do you have?
Q7. How long is your experience in performing triage for post-acute care?
Q8. How many triage cases do you handle per week?
Q9. For which specialisms do you perform triage?

(only GR professionals)

Q10. In what kind of region are you working?
Q11. How many beds does your facility have?
Q12. How many beds for geriatric rehabilitation (GR) does your facility have?
Q13. Which GR target groups does your facility offer services for?
Q14. Are there different target groups in the GR category 'mixed diagnoses'?
Q15. Does your facility offer GR at other locations?
Q16. With how many GR beds?
Q17. For which GR target groups?
Q18. Are there different target groups in the GR category 'mixed diagnoses' on this other location?
Q19. What is your age?
Q20. What is your professional background? (i.e. Physician, elderly care specialist, elderly care specialist in training, elderly care specialist-geriatric rehabilitation experts, nurse specialist, physician assistant, other)

Q21. What type of care do you work in?
Q22. How many years of experience do you have?
Q23. How long do you have experience in triage?
Q24. How many triage requests do you handle per week?
Q25. For which target groups do you perform triage?

II. The triage process

Description of triage model consisting of three steps of post-acute care decision making. The first step concerns the deliberation that discharge home is expected to be unsafe and further care needs are present. The second step is the assessment of the patient's post-hospital care needs, prognosis and preferences concerning post-acute care, resulting in a post-acute care (PAC) decision. The third step is the actual arrangement of placement in rehabilitative or other post-acute care.

II.1 First step: deliberation concerning non-home discharge.

Q27. How often are the following hospital professionals (team nurse, team manager, liaison nurse, physiotherapist, occupational therapist, resident, medical specialist) involved in the deliberations on safety of discharge home? (4-point Likert scale: never/sometimes/often/always/unknown). How much impact do these professionals have on this decision? (4-point Likert scale: none/some/quite some/much/unknown).
Q28. Are other professionals involved in this decision?
Q29. Is the patient and his family informed that the necessity of follow-up care is discussed? (Yes always/Yes, most of the time/No, most of the time they are not informed/Unknown/Other…)
Q30. What is your opinion on the contribution of the professionals to this decision? (Too little, sufficient/too much)
Q31. If you answered in Q28 about other professionals, what is your opinion on the contribution of the professionals to this decision?

II.2. Second step: assessments for PAC decision making.

Q32. At which moment is the patient and/or his family involved in PAC-decision making? (at hospital admission/when discharge approaches/this information is not in the request for triage/unknown/other…)
Q33. How do you judge the moment of informing the patient and family on the PAC decision making assessments? (1 not good-10 excellent)
Q34. How often are the following hospital professionals (team nurse, team manager, liaison nurse, physiotherapist, occupational therapist, resident, medical specialist, physiatrist, GR expert) involved in the assessment for PAC decision making? (4-point Likert scale: never/sometimes/often/always/ unknown). How much impact do these professionals have on this decision? (4-point Likert scale: none/some/quite some/much/unknown).

Q35. What is your opinion on the contribution of the professionals to this decision? (Too little, sufficient/too much)
Q36. Are other professionals involved in this decision?
Q37. What is your opinion on the contribution of the professionals to this decision? (Too little, sufficient/too much)
Q38. By which means are you consulted for PAC decision making? (by email, by telephone, in patient conference, in more than one way)
Q39. At what moment are you consulted? (day 1-3, day 4-6, day 7 or later, when the medical specialist treatment is finished, on the day of discharge, other…)
Q40. What is your opinion on the timing of this consultation? Please explain.
Q41. What are the elements of your assessment? (study patient record, discuss case with nurse, discuss case with resident or hospital paramedic, patient is seen, family is seen, different…
Q42. Do you have sufficient information to come to a conclusion on appropriate PAC?
Q43. Do you have sufficient time to come to a conclusion on appropriate PAC?
Q44. What type of involvement of GR experts in PAC decision making occurs most frequently? (case conference, independent GR expert reviews the PAC decision, GR expert of follow-up facility reviews the PAC decision, other…)
Q45. Which PAC decisions are reviewed by a GR expert before admission to a facility? (all GR referrals, only when GR referral is doubtful, only GR special target groups, other…)
Q46. For which target groups is the referral decision reviewed by a GR expert? (stroke, trauma neurology/orthopedic trauma/amputations/COPD/oncology/ Parkinsons'disease/Psychogeriatric patients)
Q47. How often is a GR expert acutely consulted by telephone for a triage request? (never/sometimes/often)
Q48. Please describe the last patient this occurred for.
Q49. Are you content with the contribution of the GR expert in PAC decisions? (1-completely discontent-10 most content).
Q50. Please explain your score in Q49.

II.3 Third step: Placement.

Q51. How much influence has a patient on choice of facility for placement?
Q52. What situations or circumstances influence the measure of influence of the patient on placement?
Q53. Hoe content are you with the measure of influence the patient has concerning the choice of facility for placement? (1 very discontent-10 most content)
Q54. Can the PAC decision change in this step?
Q55. What would be the reason for this change?
Q56. How often does the PAC decision change after the patient has been presented for admission to a facility?
Q57. What is the average number of waiting days after a PAC decision is made?

III. Triage items and measurements

Q58. How important are the following items in PAC decision making: Medication >2 times a day, Multiple chronical conditions, Incontinence, pressure ulcers, poor nutritional status, complications, vulnerability, ADL limitation or home-care twice a day, mobility loss and risk of falling, functional decline, course of previous recovery, no recovery in hospital, expected recovery post-hospital, living alone, follow-up care at own or family's request, staircase at home, previous psychiatric condition or addiction, impaired comprehension of instructions, impaired awareness of illness, delirium, anxiety/depression, severe visual or hearing impairment, age. (5-point Likert scale: not important/slightly important/important/very important/decisive)

Q59. Which other items do you assess to make PAC decisions?

Q60. Which measures do you use for PAC decision making? Rankin, Katz, Barthel Index or other instrument for functional status, SNAQ or other instrument for nutritional status, DOSs or other instrument for delirium, MMSE or MoCA for cognitive status, GDS-15 or HADS for mood complaints, CFS or handgrip strength for frailty, walking speed or Timed Up and Go for mobility, EDIZ or CSI for caregiver burden. (never/sometimes/often/always)

Q61. Do you use other instruments? (which?)

Q62. Are measurement instruments sufficiently applied in PAC decision making?

IV. Cooperation between settings in PAC decision making

(for GR-respondents)

Q63. Are regular multidisciplinary conferences or discharge conferences held for the GR patients that you are involved with concerning triage?

Q64. According to diagnostic groups (GR target groups), for which patients are such conferences held?

(for hospital liaison nurse respondents)

Q65. Are regular discharge conferences held in wards where you are consulted to arrange PAC?

Q66. According to hospital specialism, are such conferences held?

Q67. Are these conferences multidisciplinary?

Q68. Are transmural partners present in these conferences?

Q69. Which disciplines are these transmural partners? (physiatrist/GR expert)

Q70. How content are you with these conferences?(1 very dissatisfied, 10 most content)

Q71. Who is responsible for the PAC decision? (liaison nurse/resident/medical specialist/GR physician or physiatrist, the multidisciplinary team, other…)

(all respondents)

Q72. How often are you content with the PAC decision? (never/sometimes/often/always)

Q73. How content are you with your role in PAC decision making? (1 very dissatisfied, 10 most content)
Q74. Please explain this further.
Q75. What aspects for improvement of triage would you suggest?
Q76. Are results of GR trajectories shared with the referring hospital?
Q77. In what manner is this feedback given?
Q78. How is PAC decision making reimbursed?
Q79. How did this questionnaire reach you?
Q80. Did you miss something in this questionnaire?
Q81. Do you have any remarks on this questionnaire?

Supplement 2

Table S2. Professional background and setting of GR respondents

	N=156	N=198
GR respondents	N=52 (%)	
Professional background		
Elderly care physician, GR specialist	28 (53.8)	
Elderly care physician, GR specialist in training	2 (3.8)	
Elderly care physician	13 (25.0)	
Elderly care physician in training	6 (11.5)	
Nurse specialist	1 (1.9)	
Nurse specialist in training	2 (3.8)	
N of beds in PAC facility		
<100	17 (32.7)	
100-200	23 (44.2)	
>200	12 (23.1)	
Care services in PAC facility		
Geriatric rehabilitation	50 (96.2)	
Short stay residential care	29 (55.8)	
Long term care	22 (42.3)	
Community geriatric care (incl. day care center)	14 (25.0)	
Other (palliative care, covid-19 unit)	5 (9.6)	
GR Places	**In facility N=52**	**In allied facility N=28**
<15	1 (1.9)	
15-30	13 (25.0)	9 (32.1)
31-60	21 (40.4)	11 (39.3)
61-120	15 (28.8)	7 (25.0)
>120	2 (3.8)	1 (3.6)

Table S2. Continued

	N=156	N=198
Target group GR		
Stroke/neurology	45 (86.5)	17 (32.7)
Trauma	50 (96.2)	22 (42.3)
Elective orthopedic surgery	46 (88.5)	21 (40.4)
Amputation	47 (90.4)	14 (26.9)
Other GR diagnoses	50 (96.2)	23 (44.2)
Target group 'Other GR diagnoses'		**N=23**
No subdivision/miscellaneous	21 (42.0)	11 (21.2)
COPD	24 (46.2)	8 (15.4)
Cardiology	16 (30.8)	3 (5.8)
Oncology	20 (38.5)	4 (7.7)
Parkinson	13 (25.0)	3 (5.8)
Psychogeriatrics	9 (17.5)	3 (5.8)

Supplement 3. Professional contributions to PAC decisions

Table S3.1. Mean rating of professional contribution to post-acute care decision making

	Step 1 Considering non-home discharge		**Step 2 Decision on type of post-acute care**	
Professional	Liaison nurses N=104	GR professionals N=52	Liaison nurses N=90	GR professionals N=44
Team nurse				
How often involved	3.61	2.50*	2.83	2.09*
How much impact	3.17	2.23*	2.47	2.02
Liaison nurse				
How often involved	3.75	3.77	3.88	3.66
How much impact	3.94	3.58*	3.90	3.59
Physiotherapist				
How often involved	3.13	2.19*	3.02	2.20*
How much impact	3.47	2.25*	3.31	2.27*
Occ. therapist				
How often involved	2.24	1.62*	2.20	1.82*
How much impact	2.96	1.77*	2.83	2.00*
Resident				
How often involved	3.59	2.73*	3.38	2.61
How much impact	3.26	2.44*	3.21	2.36*

Table S3.1. Continued

	Step 1 Considering non-home discharge		Step 2 Decision on type of post-acute care	
Medical specialist				
How often involved	2.54	2.50	2.36	2.36
How much impact	2.79	2.73*	2.74	2.55
Physiatrist				
How often involved	Not involved	Not involved	2.30	2.39
How much impact			3.83	3.66
GR specialist				
How often involved	Not involved	Not involved	2.60	2.75
How much impact			3.62	3.68
Manager				
How often involved	1.25	0.94	1.21	0.75*
How much impact	1.34	1.21	1.18	0.86

*How often involved? 1=never, 2=sometimes, 3=often, 4=always; How much impact? 1=none, 2=some, 3=quite some, 4=very much; *p<0.05*

Supplement 4. Recommendations and remarks on improvement of PAC decision making

	Recommendations	Remarks
Patient information	Careful and complete information on patients' motivation and cognitive problems. Access to complete medical information. (More) Use of measurement instruments for triage. Add measures to triage request. Make measures of premorbid functioning available. Describe the prognosis. Be complete in the information concerning premorbid functioning. Add care needs and Barthel Index to the file. Add information of community nurse and homecare. Be comprehensive in non-somatic information that would complicate recovery. Deliver more concise and complete information. Be sure to describe actually correct information. Paramedical information and the view of paramedics on prognosis is valuable in triage. Add the medical specialists view on general condition and prognosis of the patient.	STRC patients' care needs are seldom about recovery. Incomplete information means more time and worse decisions. Triage requests differ regarding their form and procedure

	Recommendations	Remarks
Assessment	Perform a faster triage process when only advice is requested. Focus on care indication, not availability of a bed. Triage by ECP only when in doubt of PAC decision. Triage by ECP only in complex cases. Triage by Independent ECP only for complex cases. ECP is always involved in triage. Direct conversation between ECP and liaison nurse in case of refusal. Independent triage direction by liaison nurses. Allow the liaison nurse to direct 80% of triage cases. Make the triage process easier by ruling out unnecessary steps. Use digital communication. Reduce the influence of the resident in PAC conversations to avoid mistakes. As a consultant, make sure to see the patients yourself. Liaison nurse coordinates follow-up care instead of team nurse. Always involve the ECP as a consulent. Consult the ECP earlier, before a decision is made. Involve the ECP more often, earlier and better. Earlier involvement of ECP. Start placement procedure even in the absence of ECP's judgement. Give the liaison nurse a key position she has an independent opinion. GR and STRC belong under one indication, indicate the two types of care later, during PAC. Don't triage twice. Involve the ECP in STRC-low complexity triage cases. Invest triage direction in one person. Only the ECP of the PAC facility conducts triage. Skip triage altogether until after PAC-admission a case conference is held.	ECP's are focused on their own facility. Other ECP repeats triage procedure. 'Motivation' hard to capture in patients that are tired of living. Opinions of liaison nurse and facility differ. GR is not always necessary despite paramedic treatment.
Forms and electronic health records	Use one and the same electronic system. Make a triage form that is complete and easy to fill out. Review the structure of the transitional file. Complete anamneses, patients' history, in EHR. Fill in the form to consult a liaison nurse completely. Consult a liaison nurse sooner.	Forms, EHR's are confusing and unclear.

	Recommendations	Remarks
Discharge planning	Start triage at hospital admission, work discharge oriented. Improve the quality of the nurse intervention plan. Take patients' history carefully and professionally as a nurse. Liaison nurse and resident must discuss and agree on PAC options. Residents and nurses are well informed about PAC options. Consult the liaison nurse sooner, as early as possible. Work discharge oriented, discuss and adjust expectations, prepare patient and family.	Resident advises for impossible PAC options, and nurses don't know. Medical stability not yet reached or uncertain
Communication with patient and family	Inform patients and families completely and as early as possible. Discuss patients' preferences before the case conference. Explore patients' care needs. Tell patient that the focus of the hospital stay is treatment, not a change of living situation. Explore the expectations of patient and family. Inform family before discharge planning starts. Involve patient and family in decision making. Inform patient and family on follow-up care and PAC facility. Attending physician communicates well with patient and family. ECP can visit patient and family before transition to PAC facility.	
Communication with PAC facility	Early alignment between settings. Discuss complex cases with ECP.	Questions between parties go back and forth. (time consuming)
Time	Response of ECP within 2 hours of triage request. Enough ECP's to answer triage requests in time. Enough time for liaison nurses to take the lead in triage. Carrying out triage direction and responsibility means that expansion of working hours is needed. Time to follow the illness trajectory of patients. Patients with many 'bed days' demand more time for follow-up.	Too much text in transitional records Time pressure obstructs cooperation and communication.
Case conferences	Communicate complex cases Use measurements that support decision making ECP should participate more often in hospital case conferences	

	Recommendations	Remarks
Cooperation	Consult the hospital physiatrist. Liaison nurses must partake more in case conferences. Cooperation with 'next step' facilities. Cooperation in regional networks of PAC. Regularly scheduled moments for triage consultation. Hospital and PAC facilities agree on ECP's role. More feedback between settings on outcome of PAC trajectories. Overview of empty PAC beds.	ECP's hard to contact. Hospital specialists hard to contact.
Guidelines	Clear, transparent triage guidelines. Universal score system for triage. ECP's have a shared view and judgement concerning triage. Healthcare regulations are correctly applied.	Barthel Index criteria are differently applied.
Competency	All ECP's are competent to conduct triage. Hospitalists know how to conduct triage. Hospitalists understand what GR is. More triage knowledge for hospital nurses and physicians.	
Healthcare policy	More beds for STRC. Enough PAC beds. No contrary interests in triage. More beds for GR patients with dementia.	Financial reasons for refusal of patients.

ECP: elderly care physicians. EHR: electronic health record. GR: geriatric rehabilitation. PAC: post-acute care. STRC: short term residential care.

CHAPTER 7

GENERAL DISCUSSION

In this thesis we explored the scientific grounds and clinical practice of referral decision making for inpatient geriatric rehabilitation (GR), also known as 'rehabilitation decision making' or 'triage'. We approached triage as a competency based task, in which hospital staff and geriatric rehabilitation professionals collaborate. The final aim of this project was to contribute to the quality of referral decision making by exploring its scientific base, defining its core elements and delivering a conceptual model for practice.

In this chapter we will first draw a sketch of this specific GR-triage problem and our approach. In paragraph 2 we will reflect on the main findings in the triage studies. As a consequence of the explorative character of most of the studies in this thesis, these reflections will underscore triage dilemmas. In paragraph 3 we present the conceptual triage model as an implication for practice and as a means to allow future evaluation of triage. In paragraph 4 we will discuss methodological considerations concerning the triage studies we conducted and express thoughts and wishes concerning future research of this subject. This chapter will end with an overall conclusion of the thesis.

1. Triage as a problem

Whereas hospital professionals coordinate and direct the triage process and execute the transfer of patients to follow-up care settings, the medical responsibility for geriatric rehabilitation (GR) and admission to GR lies with elderly care physicians in nursing homes with geriatric rehabilitation units (Zorginstituut, 2023). The professional organization of elderly care physicians therefore issued a Triage instrument in 2013 (Verenso, 2013). In 2022, the Dutch Association of Elderly care Physicians, together with the Dutch Patient Federation published a quality document GR in which the triage responsibility of elderly care physicians attending GR patients was reconfirmed (Verenso, 2022).

As patient flow between hospitals and post-acute care settings has increased over the years, triage involved parties, such as hospital professionals, rehabilitation teams, post-acute care providers and health insurance companies felt that triage decisions could be volatile and too much based on clinical intuition. International literature reported concerns of professionals, patients and families regarding 'hasty' transitions to post-acute care (Gadbois et al., 2019; Lilleheie et al., 2019). A need for scientific underpinning was felt. Moreover, in the Netherlands, the introduction of short term recovery care (STRC) re-emphasized the need to study the GR access criteria ('what?') and evaluate the triage process ('how?') (Verenso, 2019).

Using the Verenso triage instrument of 2013 as a starting point, we explored factors, elements and steps in triage decision making, aiming for transparency of triage practice. Secondly, to bridge the gap between the contributions of 'sending' and 'receiving' professionals concerning triage decisions, this thesis presents a conceptual model of core triage elements, based on the exploratory studies in this project. Implementing these

core elements could support the quality of triage practice and initiate a stepped process with stakeholders towards the development of consensus and a field standard triage.

2. Reflections on the main findings

In this paragraph we follow the order of the chapters and perspectives in the thesis, first approaching the need for post-acute care from the perspective of the patients, whom triage would concern. We then continue by discussing the results of the triage literature review and the cohort studies. These chapters approach triage from a medical perspective. Finally we will comment on triage as a collaborative practice of care in the Netherlands, a report on the professional perspectives of hospital and rehabilitation triagists.

Patients' preferences on follow-up care (Chapter 2)
In older patients' lives interrupted by acute hospital admission, 'not being able to return directly home' is a significant development, that may introduce a first or next step in care dependency. Therefore, post-acute care decisions are sensitive. By interviewing older surgical patients waiting for discharge decisions, observing staff discharge conversations and studying medical records, we collected data from primary and secondary sources concerning these decisions. Patients' considerations revealed a mixture of concerns about care and treatment after discharge and conceptions of nursing home care. When probed towards the subject of their own recovery and follow-up care, the underlying needs 'safety', 'familiarity', 'independence', 'continuity' and 'relief' best captured their considerations.

In this multi-methods qualitative study we observed that despite their orientation towards efficiency of care, nurses and 'hands-on therapists' reported substantial contextual knowledge of patients' preferences concerning follow-up care. This valuable information may be lost when triage and transfer is coordinated by ward-independent liaison nurses.

In a qualitative summary on participation of older hospital patients in the hospital discharge process, interventions in which healthcare professionals expand and improve their communication skills are recommended (Lilleheie et al., 2019). In addition these authors pointed at the tension between client-centered goals and organizational priorities. We argued that going through the underlying needs in discharge conversations could assist in listening to older patients and in structuring such information in communications and records. This approach could endorse older patients and families to share personal values and assist them to engage in decision making concerning follow-up care, elsewhere described as 'involvement work' (Hardicre et al., 2021).

A literature review of triage factors (Chapter 3)
Following a scoping review methodology, patient associated factors that influenced triage decisions were categorized into 1) 'socio-demographic', 2) 'morbidity related', 3) 'cognitive or mental', 4) 'mobility or ADL' and 5) 'multidomain'. Multidomain triage

factors formed the largest category, containing items like frailty, resilience and case complexity. Apart from the socio-demographic group of factors, all categories comprised impairments, symptoms, syndromes and measurement instruments. Triage factors identified rehabilitation care needs or elicited the rehabilitation prognosis, two core dimensions of a triage decision. These triage factors were relevant at multiple timepoints in care trajectories of patients. Therefore, when relevant triage factors, such as ADL functioning, mobility, cognitive status and motivational factors would be addressed and reported in consecutive episodes of a patient journey, as illustrated in this study, triage decisions could rely on a more meaningful 'documentary' of the patients' capacities. Such an approach would honor the individuality of patients and the continuity of a person's health and inform triage decisions with more than a mere 'snapshot' of the functional status shortly before hospital discharge.

Two studies concerning triage relevant patient characteristics (Chapter 4 and 5)
Institutionalization, next to complications, mortality and readmissions is considered an adverse outcome parameter in vulnerable hospital patients (Pilotto et al., 2020). In our retrospective cohort study, about a third (29%) of older hospital patients were discharged to nursing homes, i.e. 'institutionalized'. However, only 14% of patients in this group were discharged to long-term care, whereas 86% were discharged to short-term rehabilitation oriented post-acute care in nursing homes.

Older and/or vulnerable patients with multimorbidity and (sub)acute functional decline constitute the target population of geriatric rehabilitation (Grund et al., 2020). In the cohort of older (70+) community living acutely hospitalized patients that we followed from admission to discharge, two physical vulnerability determinants 'ADL dependency' (Katz-ADL-6) and 'risk of falling' (Johns Hopkins Fall Risk Assessment Tool) at hospital admission were positively associated with non-home discharge from hospital. This association was not found concerning the cognitive and nutritional screening items at hospital admission. As the Dutch Safety management system (DSMS) vulnerability screening is mandatory in Dutch hospitals, its association with hospital discharge destination would allow for earlier discharge preparation as an additional aim of the vulnerability screening. Positive screening for geriatric needs at hospital admission thus fosters an opportunity to inform patients and families on post-acute care options and the decision process at an earlier stage.

In the second part of this study we followed the DSMS subcohort of patients who were referred to rehabilitation oriented care at hospital discharge, exploring multimorbidity, vulnerability and the outcome of rehabilitation trajectories. A higher age and living alone were negatively associated with discharge home after rehabilitation, confirming the findings of an earlier Dutch study (Everink et al., 2016). Independent mobility before hospital admission was positively associated with discharge home after rehabilitation in the DSMS subcohort. Multimorbidity counts were not associated with rehabilitation

outcome, despite the fact that in the analysis only rehabilitation relevant chronic conditions were counted, a selection of diagnoses defined in the 'modified Functional Comorbidity Index' (Kabboord et al., 2020).

The DSMS vulnerability screening did not include a frailty measurement instrument, which limits comparison of our findings with frailty studies in GR patients. Tolley and colleagues studied change in frailty status in 1716 geriatric rehabilitation patients; to this aim they applied the Clinical Frailty Scale (CSF), an observational measurement instrument that categorizes vulnerability as mild frailty. In their findings, frailty severity was associated with longer duration of hospital and rehabilitation stay. A better functional status before admission predicted more effective rehabilitation. Surprisingly, in their study, a higher score of multimorbidity measured with the Cumulative Illness Rating Scale did as well. Regarding this finding they argued that geriatric rehabilitation may be particularly effective in patients with severe disease in the context of frailty (Tolley et al., 2022). The best method to 'count' comorbidity as a means of eligibility for geriatric rehabilitation seems unresolved, considering the ambiguous association between comorbidity counts and rehabilitation outcome. The concept of 'complex multimorbidity', its definition and practical consequences were studied by Pati and colleagues, who concluded that "although the concept is important it may mean different things to different stakeholders, depending on the setting and the target group of interest" (Pati et al., 2023).

Neither a positive DSMS vulnerability screening at admission nor vulnerability observed by attending or liaison nurses was associated with the outcome of rehabilitation in our study. When a composite multidomain vulnerability count was used, vulnerability status and rehabilitation outcome were associated though. This finding aligns with studies concerning the impact of social vulnerability in older patients (Mah et al., 2023). In our cohort, social vulnerability items, such as 'having a small caregiver network', 'negligence' or 'addiction' seemed to be important characteristics in a triage assessment, adding to the comprehensiveness of a triage assessment.

Muscat and colleagues, who performed a Delphi study among rehabilitation experts on triage factors, stated that the vulnerability and multimorbidity of GR referred patients complicated the assessment of a rehabilitation prognosis; in their view rehabilitation needs of vulnerable patients would be more decisive in triage decisions than a non-robust functional prognosis (Muscat et al., 2022). Recently, other authors stated that as an alternative or addition to screening of vulnerability or frailty, measurement of intrinsic capacity or resilience could be valuable concerning the assessment of a rehabilitation prognosis (Hamaker et al., 2023), (Nagae et al., 2023).

Triage decision making (Chapter 6)

A comprehensive national questionnaire on triage, geriatric rehabilitation decision making, showed that hospital liaison nurses and GR professionals both felt responsibility

for appropriate referral of patients to rehabilitation oriented post-acute care, embedded in safe transitional care. Between these two 'directors of triage', characterized as 'senders and receivers' in their consecutive settings of care, cooperation is appreciated, though not regulated or governed. The Health Care Act affirms the responsibility of hospital specialists for safe discharge of patients and the responsibility of GR physicians to issue medical grounds for GR upon admission (Zorginstituut, 2023).

The interpretation of patient associated triage items concerning their impact on decision making differed between professionals of the two settings. Hospital professionals primarily searched for adequate and safe follow-up care. They were guided by the formal criteria of access to geriatric rehabilitation, such as presence of multidisciplinary rehabilitation needs, multimorbidity and a diminished endurance for treatment. Rehabilitation team triagists seemed to focus mainly on individual prognostics and the dilemma whether the patient would need rehabilitation treatment or short-term supportive nursing home care. Recently RePAT, an instrument to establish the rehabilitation potential of older and frail hospital patients, was developed by Cowley and colleagues in the UK. This open question holistic person-centred assessment tool was felt to support triagist professionals to explicit their considerations on care needs and rehabilitation prognosis, taking up 30 to 40 minutes to complete (Cowley et al., 2021; Cowley et al., 2022).

The involvement of families in triage decision making was missed by the majority of rehabilitation team professionals, though not by hospital triage professionals. In a systematic literature review with meta-analysis engagement of family caregivers was found to enhance the outcome of transitional care interventions both positive and negative (Levoy et al., 2022). In another recent interview study with family caregivers of geriatric rehabilitation patients, their ambivalence concerning involvement in supportive care and decision making was expressed, probably since more engagement would increase their burden (Mouchaers et al., 2023). Further research is needed concerning responsible methods for active engagement of family caregivers in triage decisions.

3. Implications for clinical practice, a conceptual model

The Triage study project aimed to identify scientific elements of a best practice GR triage, the timely patient centered process of collaborative clinical decision making concerning geriatric rehabilitation.

To that aim, we present a scheduled summary of the triage process in Table 1.

In Table 2 the findings in our studies are applied to the Efficient Practice and Organization of Care model with its three dimensions: 1) patient care; 2) professional competence; 3) organizational demands (Glenton et al., 2022; Mowatt et al., 2001). Alternative models we considered were the Rainbow model with four dimensions (patients, professionals,

organization, system) and the Contextual clinical decision making model with four fields (clinical state, research evidence, patient preferences, patient context) (Valentijn, 2016; Valentijn et al., 2015; Weiner, 2022). See Supplement A. When implemented as integrated care, triage decision making would best be evaluated in six domains, following the taxonomy for integrated care (Valentijn et al., 2015).

After adaptation, the conceptual GR-triage model may be useful for post-acute care decision making concerning adjacent types of follow-up care, such as home based GR or STRC.

Triage principles

A triage process identifies the sub-acute care option that is the most appropriate and profitable for the patient in his personal context (Kogan et al., 2016).

Triage is a timely, multidisciplinary and stepped process of decision making (Verenso, 2013).

Table 1. A summary of the triage process in a care trajectory

(before) Hospital admission	Identification of vulnerability or frailty Informing patient and family about geriatric involvement and discharge process.
Discharge planning	Non-home decision Communication with patient and family about non-home discharge. Triage assessment* Interprofessional consultation Dashboard check Shared decision making with patient and family resulting in a placement decision** Communication with preferred facility
Hospital discharge	Coordination of transitional care actions Transfer of patient
After (admission to) rehabilitation	Feedback information***

Triage assessment

Triage factors, including rehabilitation needs can be structured and reported in three domains following the biopsychosocial model (Engel, 1977), in five domains following the International Classification of functioning (ICF) or the SAMPC model of care for older patients (Snitjer, 2017). See Supplement B.

***** Triage decision making***

Triage decision making implies the balancing of patient and context information concerning three dimensions: 1) the patient's wishes and preferences concerning rehabilitation and care; 2) actual rehabilitation needs; 3) prognosis concerning recovery and benefit of rehabilitation treatment (Cowley et al., 2022; de Groot et al., 2023; de Groot et al., 2022).

****Triage feedback***

Triage feedback concerns the quality of individual triage decisions through evaluation of course and outcome of the GR trajectory that followed.

Table 2. A conceptual model of the triage process

Patient care	Direct	Indirect
Vulnerability screening[1]	Outcome of admission vulnerability screening, geriatric co-treatment and probability of delayed or non-home discharge are discussed with patient and family in a planned conversation.	Interprofessional coordination in case of involvement of a geriatric team.
Start of discharge planning	The notion that hospital discharge is near and discharge planning has started is communicated with the patient and his family. In this conversation the process of decision making on follow-up care is introduced (what, who, when) and a discharge conversation is planned, patient and family are invited to participate.	Appointment of a triage coordinating professional. A hospital nurse (specialist) can be involved to coordinate the triage and transfer process.
Triage assessment	Collection of relevant multidisciplinary and context information. 1) main diagnosis, comorbidities (wFCI) and geriatric syndromes, the medical treatment plan with prognosis and risk management. 2) premorbid and actual functional and mobility status. (Barthel Index, Functional Independence Measure, Katz-ADL-6, FAC. 3) assessment of multidimensional vulnerability concerning the social domain, cognitive and physical impairments or geriatric syndromes not registered as comorbidities, such as pain or incontinence. See Supplement C. 4) Communications and reports of team members concerning the patient's personal needs and wishes, his considerations regarding motivation to be admitted to a rehabilitation facility, family's opinions concerning preference of follow-up care.	All triage relevant information is assembled into a concise report for decision making. Geriatric rehabilitation options are considered based on outcome of the triage assessment. This consideration is guided by 6 core geriatric rehabilitation themes: 1) 'actual rehabilitation needs', 2) 'motivation'(or expecting to find motivation during the trajectory) 3) 'positive rehabilitation prognosis' despite 4) lowered therapy endurance, 5) diminished 'learnability' and/or 6) multidimensional vulnerability.
Preliminary decision		Depending on the above themes a preliminary decision is reached. A geriatric rehabilitation expert is consulted if needed[2] Depending on main diagnosis and specific care needs placement options are considered.

Table 2. Continued

Patient care	Direct	Indirect
Shared decision making	The triage decision is discussed with patient and family (why? what? where? when?) in a planned discharge conversation with patient and family that is held in a manner and setting that endorses their participation.	In an interprofessional contact with the next setting of care the admission date and the requirements of transitional care are discussed. Preparations for discharge, including written and/or verbal handovers are made.

1 Measurement of frailty, intrinsic capacity or resilience are alternatives to vulnerability screening. 2 Alternatively, triage decisions are discussed in weekly multidisciplinary case conferences with a rehabilitation expert. This procedure is recommended for neuro-rehabilitation patients as well as for all other patients with a high care complexity, such as older oncology or vascular surgery patients. In these cases, triage relevant information would be too comprehensive and multi-layered to summarize. When triage decision making is complex due to severe social or cognitive vulnerability, psychiatric comorbidity or prognostic uncertainty, a targeted multidisciplinary meeting can be held in which the resident and a geriatric rehabilitation expert discuss the patient's case in detail, aiming to find the most appropriate follow-up care.

Professional features	
Competencies	Triage responsible professionals[1] have expertise concerning rehabilitation of (older) patients with vulnerability.
	Triage responsible professionals endorse patient and family's involvement in decision making concerning follow-up care after hospital discharge.
	Triage responsible professionals contact a rehabilitation expert when necessary to reach a triage decision.
	Triage responsible professionals are well informed about rules and regulations concerning access to geriatric rehabilitation.
Cooperation	Triage responsible professionals work closely together with nurses, residents and allied health professionals (AHP) that attend to the patient.
	Rehabilitation experts involved in triage decisions, understand and align to the hospital work flow.
	A geriatric rehabilitation consultant is (part-time) available for consultation and partakes in multidisciplinary meetings concerning patient discharge and triage.
Networking	Triage responsible professionals have access to sources of triage information, such as community care workers, general practitioners and social workers, who are involved with the patient.
	Triage responsible professionals liaise with regional care organizations. They oversee the availability of rehabilitation oriented post-acute care in the region and the provision of specialized care, such as short-term care for patients with cognitive symptoms or targeted geriatric rehabilitation care.
	Triage responsible professionals have easy access to each other, both for consultation concerning triage decisions and for feedback in individual cases.

Table 2. Continued

Professional features	
Responsibility	The attending resident is responsible for the triage decision concerning safe discharge.
	The professional directing the triage process is responsible for the triage process.
	The consulted rehabilitation expert is responsible for his advice as a part of the clinical triage decision.
	The entire responsibility for a triage decision can be delegated to a specialist hospital nurse under mutual, bilateral accepted terms.

1. Liaison nurses, residents and physicians working in geriatric rehabilitation facilities.

Organizational features and demands	
Shared vision	Care organizations, such as hospitals and providers of geriatric rehabilitation care consent to a shared responsibility for adequate patient flow and avoidance of bed-days in all settings (normative integration)
Facilitation of best practice	Hospital work flow allows for careful discharge planning including communication with patient and family and consultation of rehabilitation experts.
	Work flow in post-acute care allows rehabilitation professionals to perform triage consultations.
	Care organizations encourage communication between hospital and rehabilitation professionals concerning triage decision making.
Evaluation	Hospitals and regional care organizations analyze, exchange and discuss their data on referral to and discharge from rehabilitation-oriented post-acute care on a regular basis. These evaluations inform health care policymakers concerning use and volume of sub-acute care provisions.

4. Methodological considerations and future research

'Instead of 'plan-do-study-act', apply 'dream-act-reflect-learn'

In daily practice GR triage can be felt as a rather obscure clinical decision evolving somewhere in the shadowlands between hospitals and sub-acute care facilities. No one seems responsible when rehabilitation decisions are questionable, such as those concerning patients too unwell to survive outside the hospital, patients unwilling or unable to participate in therapy or occasionally patients too mobile and independent to even need rehabilitation. In addition, along the rehabilitation trajectory it can become clear that family caregivers of GR-patients never hoped for discharge home of their relative. In general, no 'triage quality of care' data are collected, apart from health economic evaluations on duration of post-acute care and discharge destination. Research concerning GR triage is scarce.

We started this project 'dreaming' (Reed & Card, 2016) of evidence regarding the best quality of triage concerning referral to geriatric rehabilitation, thinking of trials that would transparently compare the outcome of new triage interventions with usual care. This lead to ideas, such as 1) triage performed by dedicated professionals with geriatric and rehabilitation expertise or 2) triage as an element supporting the continuity of patient care in a trajectory from home to hospital admission and expanding beyond geriatric rehabilitation discharge or 3) triage as collaborative clinical decision making in digital case conferences with rehabilitation experts, and 4) diagnose-specific triage criteria for 'medical', 'surgical' or 'neurologic' patients who follow different programs in geriatric rehabilitation. The results of these trials would not only be relevant for acutely hospitalized older or frail patients, but for all older frail patients who were expected to benefit from an episode of integrated rehabilitation-oriented care. GR Triage as a subject, however, turned out to resemble a 'wicked' problem, being hard to define, analyze and resolve (Varpio et al., 2017).

Exploratory research questions needed answering first, which led towards a scoping review, observational studies and a national survey. A more or less impressionist picture of triage in the Netherlands was drawn through meaningful context information collected from 'soon to be triaged' hospital patients, literature, datasets of GR referred patients and the views of triage responsible professionals. Step by step we came to realize what lessons for triage practice could be learned, and views on future studies developed.

Reflecting on the work we had done, several limitations were seen.

a. We did not perform a concept mapping study of triage as a 'wicked' problem. As a definition of triage we used 'the dynamic process of decision making concerning the eligibility for geriatric rehabilitation of older and/or vulnerable hospital patients'. (Verenso, 2013) In view of emerging and adjacent post-acute care services as well as adjustments in the access procedures to GR, concept mapping might have set a clearer foundation. Overall we applied a primarily 'professional-based', 'clinical' approach of triage. Although one of the studies explored the perspective of patients on follow-up care, patient-centered aspects of triage were not studied in depth. Societal aspects of triage, such as equity, were left out.
b. No representatives of 'older patients' were involved in the design, execution or analysis of the triage studies.
c. The larger part of this study was restricted to the Dutch situation and executed within the practice, culture and regulations of the Dutch healthcare system. We exclusively studied transition of patients from hospital to geriatric rehabilitation. These choices have limited the generalization of the results. Aase and colleagues state that 'transitional care is a complex construct that is characterized differently across different healthcare systems' (Aase & Waring, 2020). As geriatric rehabilitation in the Netherlands is provided in nursing homes or skilled nursing

facilities that are remote from the referring hospital, establishing a consensus based cooperation in triage would be of real consequence to patients and professionals.

d. Compared to the abundance of studies concerning transitional care at hospital discharge, triage as a transitional care related subject was virtually absent in studies. This is an enigmatic finding in view of its urgency and the increasing societal dilemmas behind triage.
e. We studied usual care data in the cohort study. There is no national agreement or consensus on the application of measurement instruments in triage assessments or geriatric rehabilitation trajectories, apart from the UNC-ZH core set of measurement instruments (Doornebosch, 2018). Together with a large number of missing data, these circumstances hindered comparison with other cohort studies. Sample size and quality of the cohort data was insufficient to perform advanced statistical analyses such as prediction modeling or factor analyses.
f. The conceptual triage model in this thesis has not yet undergone a structured field consultation by triagists nor has it been evaluated in a wider context by stake holders, such as older patients, caregivers, residents, multidisciplinary GR teams, hospital or care facility managers, health insurance companies and policy makers.

Future triage research and triage development

In a heuristic model, Aase and colleagues described quality of transitional care as 'encompassing patient-centered, communicative, collaborative, cultural, competency-based, accountability-based and having spatial components to ensure interaction among the patients and carers, the healthcare professionals and the organizations, as patients move across care settings' (Aase & Waring, 2020). These seven quality themes would apply to future triage studies as well.

1) Future studies in this field should be based on co-creation with patients, their families and triage-involved parties and could start with a realist evaluation to specify context, mechanisms and output of triage. Such a concept study would facilitate the critical choices that underly the exact scope and design of future triage projects. Triage concerning geriatric rehabilitation, like other transitional care issues, comprises horizontal and vertical cooperation themes, e.g. issues of communication and dialogue between settings (horizontal) and accountability grounded in system level issues and regulations (vertically).
2) We would welcome a field consultation of the conceptual triage model including its measurement instruments, followed by implementation in a limited number of pilot region(s). Evaluation would also imply monitoring the pre-referral and post-referral trajectory.
3) In addition, evaluation of training in triage for liaison nurses, physicians and medical students would support the quality of referral of older and vulnerable patients to post-acute care (Goreshnik et al., 2022).

5. Overall conclusion

This thesis sheds light on the 'how' of triage decision making concerning a referral to geriatric rehabilitation. These triage decisions require a comprehensive assessment of the patients' wishes and preferences, the actual rehabilitation needs and a realistic functional prognosis. The core characteristics that geriatric rehabilitation candidates share are the occurrence of acute or subacute functional impairment and mobility loss. Multimorbidity that impacts a person's rehabilitation potential and multidomain vulnerability are additional characteristics of GR candidates. They are factors that influence both rehabilitation needs and functional prognosis and therefore should be carefully assessed.

These triage relevant patient characteristics should preferably be identified early during hospital stay. Attending 'hands-on' professionals, such as nurses and therapists have opportunities to register a patient's considerations concerning discharge destination and follow-up care. Controversies were felt in the measure of family involvement in triage between sending ('too much') and receiving ('not enough') parties. Sending ('proper placement') and receiving ('best benefit') triagists also prioritized triage criteria according to their own perspective and role. Their cooperation for the best part is indirect via reports and handovers, although direct contact in a consultation is appreciated and considered valuable on both sides when it occurs. Such interprofessional consultation and the participation of rehabilitation specialists in case conferences is to be facilitated by hospitals and care organizations. Workflow focusing only on efficiency does not seem to endorse triage quality.

Implementation of the proposed triage model could support the quality of decision making and facilitate evaluation of triage practice between settings, now scarce. Such implementation and evaluation underly a stepped process towards the development of a field standard.

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Supplemental material

Supplement A. Models of care

Model	Domains	Description
Effective Practice and Organization of care[1]	Micro	Patient care
	Meso	Professional competencies
	Macro	Organizational aspects
Clinical decision making[2]	Micro	Clinical state
		Research evidence
		Patient preference
		Patient context
Rainbow model[3]	Micro	Patients
	Meso	Professionals
	Meso	Organizations
	Macro	System
Taxonomy of integrated care[4]	Micro	Clinical integration
	Meso	Professional integration
	Meso	Organizational integration
	Macro	System integration
	Micro, meso, macro	Functional integration (key support functions)
	Micro, meso, macro	Normative integration (frame of reference)

1. (Mowatt et al., 2001) 2. (Weiner, 2022) 3. (Valentijn et al., 2013) 4. (Valentijn et al., 2015)

Supplement B. Methods to categorize health-related goals of care

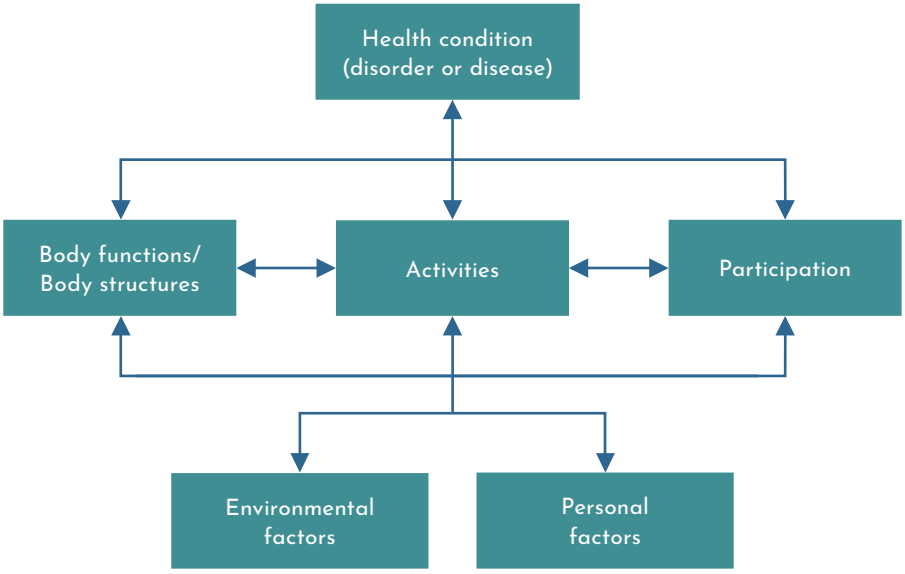

Figure B1. International Classification of functioning

A *health condition* is an umbrella term for disease, disorder, injury or trauma and may also include other circumstances, such as aging, stress, congenital anomaly, or genetic predisposition. It may also include information about pathogeneses and/or etiology.

Body functions are defined as the physiological functions of body systems, including psychological functions. *Body structures* are the anatomical parts of the body, such as organs, limbs and their components. Problems in body functions (e.g. reduced range of motion, muscle weakness, pain and fatigue) or significant deviation or loss of body structures (e.g. deformity of joints) are referred to as impairments of a body function and structure respectively. *Activity* is the execution of a task or action by a person. *Participation* refers to the involvement of a person in everyday situations and in society. Difficulties at the activity level are referred to as activity limitations (e.g. limitations in dressing) and problems a person may experience in being or getting involved in everyday situations and in society are denoted as participation restrictions (e.g. restrictions in recreation and leisure).

Contextual factors represent the entire background of a person's life and living situation. Among the contextual factors, the *environmental factors* make up the physical, social and attitudinal environment in which people live. These factors are external to the person and can have a positive or negative influence, i.e., they can serve as a facilitator or a barrier for a person›s functioning. *Personal factors* are the particular background of a person›s life and living situation, and comprise features that are not part of the primary health condition. These may include but not limited to gender, age, race, fitness, lifestyle, habits, and social background. They can be considered factors which define the person as a unique individual. Like environmental factors, personal factors can have a positive or negative impact on a person›s body functions and structures, and activities and participation.

World Health Organization. International Classification of Functioning, Disability and Health, Geneva, World Health Organization; 2001.

Table B2. Post-stroke problems categorized in ICF and SAMPC (Hertogh, 1997; Snitjer, 2017).

Problem	ICF classification	SAMPC classification
Hemiparesis	Body function impairment	Somatic impaiment
Limitation in toiletting	Activity limitation	ADL limitation
Dependent in visiting a theatre show	Participation limitation	Societal limitation
Dislike of being dependent on others	Personal factors	Psychologic issue
Living with spouse who assists in ADL	Environmental factors	Societal/ADL

Supplement C. Triage relevant measurements in the care trajectory

Main diagnosis[1]	Hospital admission	Hospital discharge
wFCI		Hospital discharge
BI or Katz-ADL	Premorbid	Hospital discharge
FAC	Premorbid	Hospital discharge
CFI	Premorbid	Hospital discharge
DSMS-score[2]	Hospital admission	
Memory problems		Hospital discharge
Delusions		Hospital discharge
Disorientation		Hospital discharge
Behavioral problems		Hospital discharge
Mood complaints		Hospital discharge
Living alone	Premorbid	
Small network	Premorbid	
Addiction	Premorbid	
Negligence	Premorbid	
Homelessness	Premorbid	
Obesity		Hospital discharge
Incontinence		Hospital discharge
Hearing aid		Hospital discharge
Aphasia		Hospital discharge
Home care visits per day	Premorbid	
Living with caregiver	Premorbid	
Visual impairment[3]		Hospital discharge

1. Surgical (trauma, amputation, elective orthopedic, other), medical (infection/organ failure, other) or neurological (stroke/trauma) main diagnosis. 2. Dutch Safety Management System vulnerability score. 3. Counts as a comorbidity in wFCI
wCFI=weighted Functional Comorbidity Index.
BI=Barthel Index. ADL=Activity of Daily Living. FAC=Functional Ambulation Class. CFI=Clinical Frailty Scale

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APPENDICES

SUMMARY

SAMENVATTING

CURRICULUM VITAE

PORTFOLIO

PUBLICATIONS

DANKWOORD

Summary

Older hospital patients are vulnerable to adverse outcomes of hospital stay, such as functional decline, deterioration and institutionalization. In aging societies, as a consequence, post-acute care (PAC) programs were developed to support functional recovery when hospital stay had led to sincere functional deterioration. This thesis focuses on the referral of older or frail hospital patients to geriatric rehabilitation (GR).

Geriatric rehabilitation consists of medically supervised, integrated care programs that can involve rehabilitation nursing, physiotherapy, occupational therapy, nutritional care, psychosocial support and speech therapy. These programs are targeted at older, vulnerable or multimorbid patients with acute functional decline as a consequence of trauma, orthopedic surgery, amputation, neurological trauma or stroke. In addition, patients recovering from internal medical illness that gravely affected their physical condition and functional status are admitted to GR. A survey on patients and structures of GR care across European countries showed that the mean age of patients was 80 years (SD 4.1). National GR-capacity and the duration of GR-stay varied greatly between countries, ranging from 70 beds per 100.000 inhabitants (Belgium) to 10 per 100.000 (Germany). Length of stay varied from 7 to 65 days. In 2013 geriatric rehabilitation was invested in the Netherlands and each year over 50.000 GR trajectories are registered. The eligibility for geriatric rehabilitation as a post-acute care trajectory and triage, the decision making process concerning this referral is the subject of this thesis.

Over 90% of patients are admitted to GR following a hospital stay. In Dutch hospitals, liaison nurses who are specialized in transitional care, assess the eligibility of patients for GR and present candidates to GR-facilities. In an unknown number of cases these proposed admissions are refused by the post-acute care facility due to alleged absence of rehabilitation goals, patient complexity or medical instability. The outcome of hospital triage decisions can represent a source of tension between 'sending' and 'receiving' care settings, especially because responsibilities on either side are not inter-professionally established. Health care insurance companies demand a medical indication for each patient admitted to GR and hold rehabilitation facilities accountable for the outcome of the GR trajectories. Interprofessional consensus in GR referral decision making, based on scientific exploration of triage factors would potentially support their cooperation in transitional care and allow for evaluation of GR patient flow, case mix and rehabilitation outcome.

The triage instrument for geriatric rehabilitation developed in 2013 by the professional association of elderly care physicians, Verenso, mentions six conditions or patient-criteria to qualify for GR: 1.) vulnerability, 2.) rehabilitation needs, 3.) a positive functional prognosis implying that return to the original living situation could be expected, 4.) ability to learn from rehabilitation treatment, 5.) sufficient endurance to train and 6.) motivation

to actively partake in the rehabilitation treatment. With the introduction of short-term recovery care (STRC, 'Eerstelijnsverblijf') in 2017 a new decision aid was developed covering both types of short-stay care options. The Verenso triage instrument nor the STRC decision aid has been evaluated since.

This thesis explored the evidence supporting a referral decision as well as the 'triage assessment' in which appropriateness of geriatric rehabilitation is evaluated. We studied this assessment primarily as a task demanding professional expertise. As a second angle the 'transmural' interplay of organizational dilemmas concerning transition to post-acute care presented. These primary and secondary aspects highlighted triage as a professional task under managerial pressure and intertwined with interests, not strictly associated with individual patient care.
The research questions were:

1. What are older patients' attitudes and thoughts regarding follow-up care at hospital discharge?
2. What items, instruments and methods concerning referral of hospital patients to GR are reported in literature?
3. What are the characteristics of hospital patients referred to GR in comparison with patients not referred?
4. Which hospital and/or rehabilitation professionals are involved in GR referral decision making and what triage items and methods are used?
5. What are core elements of a best practice referral to GR in the Netherlands?

These exploratory triage studies aimed to contribute to the quality of referral decision making by presenting a conceptual model of the multilevel triage process with its professional and organizational aspects.

'Older patients preferences on follow-up care, a qualitative multi-methods study' is presented in **Chapter 2**. Post-acute care decisions at the end of hospital stay can mark the imminent chronicity of impairments and care dependency. The aim of the study was to reach a deeper understanding of older patients' own considerations on follow-up care. On a surgical ward we performed three months of fieldwork. Participants in the study were older, post-operative patients who were expected to need follow-up care after discharge. Bedside conversations with patients and inter-staff discharge conversations were observed, participants were interviewed and medical record data concerning hospital discharge were studied. We used inductive thematic analysis and identified five underlying needs: safety, familiarity, independence, continuity and relief. These concepts may be used as a framework in discharge conversations. We argued that going through the underlying needs with patients could assist in hearing their voice and structuring their information in communications and records. This approach would endorse patients and families to engage in decision making concerning follow-up care.

Chapter 3 presents a scoping review of triage factors in acutely hospitalized older patients. Aim of the study was to create an overview of items, instruments and methods concerning referral of hospital patients to geriatric rehabilitation. A scoping review addresses broad research questions and aims to create a synthesis of knowledge and define the focus of further research. Following the Arksey and O'Malley's framework for rigor of scoping reviews, we reviewed a broad spectrum of literature reporting the path of care of acutely admitted older hospital patients needing a rehabilitation trajectory. After categorizing the selected abstracts in distinct geriatric rehabilitation care pathways like stroke, hip fracture, amputation, cardiac and oncological rehabilitation the 29 abstracts on internal medical patients were included and further reviewed. Of these, 13 studies focused on factors identifying rehabilitation needs and 16 on factors associated with outcome of geriatric rehabilitation. We categorized factors into demographic, diagnosis-related, mental, functional and multi-domain factors and mapped them in a transitional care pathway.

In **Chapter 4** we introduce the DSMS-2019 cohort, consisting of older patients that were community living at baseline and acutely admitted to one tertiary hospital. The Dutch Safety Management System (DSMS) prescribes a vulnerability screening of all 70+ patients at hospital admission. In the DSMS cohort we included all patients of 70 years and older, who were discharged between January 15 and May 15, 2019. In order to study characteristics of patients referred to geriatric rehabilitation, we assembled demographic and clinical data including the DSMS vulnerability score and information concerning discharge direction after hospital stay. In order to elicit associations of patient characteristics with discharge destination after hospital stay data was analyzed in three discharge destination groups: 'Home', 'Geriatric rehabilitation' and 'Other nursing home care'. Among 491 hospital discharges, 349 patients (71.1%) returned home, 60 (12.2%) were referred to geriatric rehabilitation, and 82 (16.7%) to other inpatient post-acute care. Non-home referral from hospital increased with age from 21% (70–80 years) to 61% (>90 years). A surgical diagnosis (odds ratio [OR]=4.92; 95% confidence interval [CI], 2.03–11.95), functional decline represented by Katz-activities of daily living positive screening (OR=3.79; 95% CI, 1.76–8.14), and positive fall risk (OR=2.87; 95% CI, 1.31–6.30) were associated with non-home discharge. The Charlson Comorbidity Index did not reach significance between the groups. The usual care data of the DSMS vulnerability screening can raise awareness of discharge complexity and provide opportunities for decision making earlier during hospital stay.

In **Chapter 5** we report on the geriatric rehabilitation subgroup, springing from the DSMS-2019 cohort and consisting of patients, who were referred to rehabilitation-oriented care at hospital discharge. During the inclusion period liaison nurses invited all patients who needed a post-acute care decision to participate in the study, regardless of their age. The inclusion criterion for this study was: 'being referred to geriatric rehabilitation, short-term recovery care or rehabilitation in long-term care'. Participants

gave informed consent to study their hospital and post-acute care records. Out of 87 referred patients with a mean age of 76.3 years, 73 started a rehabilitation oriented post-acute care trajectory, 60 of these patients (82%) were discharged home. Age, living alone, baseline mobility, comorbidities, complications during post-acute care and the number of social vulnerability determinants differed in discharge destination groups, as well as a multi-domain vulnerability count. The DSMS vulnerability score at hospital admission was not associated with discharge destination after rehabilitation. By following patients from hospital admission to post-acute care discharge we could analyze associations between baseline characteristics, morbidity data, physical, social and psychological vulnerability determinants and the outcome of post-acute care Although these findings must be interpreted with care given the sample size and the large number of post-acute care facilities involved, they provide post-acute care decision making with elements of preliminary orientation. The association between social vulnerability determinants and rehabilitation outcome requires care that is targeted at individual needs.

In **Chapter 6** we report a national survey on post-acute care decision making in the Netherlands. The survey focused on professional contributions, patient involvement and the use of triage items and measures. This study addressed two research questions:

1. 'Which hospital and/or rehabilitation professionals are involved in GR referral decision making and what triage methods are used?'
2. 'Which non-clinical factors are associated with the process of referral to GR?

Hospital and geriatric rehabilitation professionals in the Netherlands participated as respondents, representing 'sending' and 'receiving' professionals as a group. A comprehensive web-based questionnaire was used with open, multiple choice and closed questions, exploring in detail how assessment of hospital patients in need of a post-acute care decision was performed. One section of the questionnaire addressed organizational aspects of triage. Descriptive statistics were applied together with deductive coding of qualitative data. A total of 104 hospital liaison nurses (66.7%) and 52 GR professionals (33.3%) participated. Respondents were reasonably satisfied with the current triage practice. Hospital liaison nurses valued their operational responsibility for triage. Geriatric rehabilitation professionals wanted active involvement in decision making and deemed hospital paramedic expertise sub-optimally applied. 'Too little involvement' of patients and families was felt by 50.0% of the GR respondents versus 15.5% of hospital respondents. The importance of half (47.8%) of the triage items was rated differently between respondent groups. The patients' voice may be insufficiently heard in triage decisions. When discussing complex cases between sending and receiving professionals, their views were felt as complementary. This study offers ingredients to reach a multi-professional view on post-acute care decision making and referral to geriatric rehabilitation.

In **Chapter 7**, the general discussion, the problem of GR-triage is depicted and the results of the triage studies as well as the limitations we encountered are reflected upon. Triage as a subject has characteristics of a 'wicked problem'. Based on the results of the triage studies, elementary steps of a GR-triage process are described. Components in these consecutive steps are further depicted in three dimensions: 1) patient care; 2) professional competence; 3) organizational features. This conceptual triage model has not yet undergone a field consultation by triage involved parties, nor has it been evaluated in a wider context by stake holders, such as older patients, caregivers, residents, multidisciplinary GR teams, hospital and care facility managers, health insurance companies and policy makers. Implementation of the conceptual triage model could support the quality of decision making and facilitate evaluation of GR-triage practice. Implementation and evaluation underly a stepped process towards the development of a field standard.

Samenvatting

Oudere ziekenhuispatiënten zijn kwetsbaar voor de nadelige gevolgen van ziekenhuisverblijf, zoals functionele achteruitgang, algehele verslechtering en opname in langdurige zorg. In vergrijzende samenlevingen werden om die reden programma's voor post-acute zorg ontwikkeld die hun functionele herstel ondersteunen wanneer ziekenhuisverblijf heeft geleid tot ernstige achteruitgang. De studies in dit proefschrift zijn gericht op het proces van doorverwijzing van oudere of kwetsbare ziekenhuispatiënten naar geriatrische revalidatie (GR).

Geriatrische revalidatie bestaat uit multidisciplinaire zorgprogramma's, die revalidatieverpleging, fysiotherapie, ergotherapie, voedingszorg, psychosociale ondersteuning, logopedie en ouderengeneeskundige behandeling omvatten. Deze programma's zijn specifiek gericht op oudere, kwetsbare of multimorbide patiënten die lijden aan acute functionele achteruitgang, bijvoorbeeld als gevolg van trauma, orthopedische chirurgie, amputatie, neurologisch trauma of beroerte. Ook patiënten die moeten herstellen van een infectie, andere medische aandoeningen of een intensieve oncologische behandeling kunnen opgenomen worden voor GR wanneer fysieke conditie en functionele status ernstig zijn aangetast. Een enquête over geriatrische revalidatie in Europese landen toonde aan dat de gemiddelde leeftijd van deze revalidanten 80 jaar was (SD 4,1). De GR-capaciteit en de duur van het GR-verblijf varieerde aanzienlijk tussen landen, van 70 bedden per 100.000 inwoners (België) tot 10 per 100.000 (Duitsland). De gemiddelde verblijfsduur varieerde tussen 7 en 65 dagen. Sinds 2013 is geriatrische revalidatie in Nederland verzekerde zorg; jaarlijks worden meer dan 50.000 GR-trajecten geregistreerd. Zorgverzekeraars vereisen een medische indicatie voor elke patiënt die wordt opgenomen in GR en houden zorgcentra die revalidatie aanbieden verantwoordelijk voor duur en uitkomst van de GR-trajecten. Het in aanmerking komen voor geriatrische revalidatie en de besluitvorming over deze verwijzing, triage, is het onderwerp van dit proefschrift.

Meer dan 90% van alle GR-patiënten wordt opgenomen na een verblijf in het ziekenhuis. In het ziekenhuis beoordelen de transferverpleegkundigen, die gespecialiseerd zijn in transitiezorg, of patiënten in aanmerking komen voor GR en stellen ze kandidaten voor aan de GR-zorginstellingen. In een onbekend aantal gevallen worden deze opnames geweigerd door de GR-zorginstelling vanwege het ontbreken van haalbare revalidatiedoelen, complexiteit van de zorgvraag of vanwege medische instabiliteit. De uitkomst van triagebeslissingen in ziekenhuizen kan een bron van spanning zijn tussen verwijzers en 'ontvangende' zorgverleners, mede omdat professionele verantwoordelijkheden niet duidelijk zijn omschreven. Interprofessionele consensus over de besluitvorming bij GR-verwijzing, gebaseerd op wetenschappelijk onderzoek naar triagefactoren, zou de samenwerking in deze transitiezorg kunnen ondersteunen en daarnaast evaluatie van de GR-patiëntenstroom, de casemix en de revalidatieresultaten mogelijk maken.

Het triage-instrument voor geriatrische revalidatie dat in 2013 door Verenso, de beroepsvereniging van specialisten ouderengeneeskunde, werd ontwikkeld noemde zes voorwaarden of criteria om in aanmerking te komen voor GR: 1.) kwetsbaarheid, 2.) revalidatiebehoeften, 3.) een positieve functionele prognose zodat terugkeer naar de oorspronkelijke woonsituatie kan worden verwacht, 4.) vermogen om te leren van revalidatiebehandeling, 5.) voldoende uithoudingsvermogen om te trainen en 6.) motivatie om actief deel te nemen aan de revalidatiebehandeling.

Na de introductie van kortdurende herstelzorg (STRC, 'Eerstelijnsverblijf') in 2017 is vervolgens een beslishulp ontwikkeld voor meerdere typen kortdurende herstelgerichte zorg. Noch het Verenso triage-instrument noch de STRC-beslishulp is sindsdien geëvalueerd.

In dit proefschrift is de wetenschappelijke kennis onderzocht die ten grondslag ligt aan een beslissing tot verwijzing naar GR ('triagebesluit') en aan het onderzoek om de geschiktheid voor geriatrische revalidatie te beoordelen, het 'triage assessment'. We hebben triage primair bestudeerd als een taak die professionele expertise vereist. Het transmurale samenspel en de organisatorische dilemma's die samenhangen met de transitie van ziekenhuis naar post-acute zorg is daarbij als tweede invalshoek naar voren gekomen. Deze uitgangspunten kenschetsen triage voor GR als een professionele taak, die verweven is met aspecten die individuele patiëntenzorg overstijgen.
De onderzoeksvragen waren:

1. Welke houding en overwegingen hebben oudere patiënten bij ontslag uit het ziekenhuis ten aanzien van nazorg?
2. Welke factoren, instrumenten en methoden met betrekking tot het doorverwijzen van ziekenhuispatiënten naar GR worden in de medische literatuur besproken?
3. Wat zijn de kenmerken van ziekenhuispatiënten die naar GR worden verwezen in vergelijking met patiënten die niet worden verwezen?
4. Welke ziekenhuis- en/of revalidatieprofessionals zijn betrokken bij de besluitvorming over GR-verwijzingen en welke triage-items en -methoden worden gebruikt?
5. Wat zijn de kernelementen van een optimaal proces van verwijzing naar GR in Nederland?

Met de resultaten van deze verkennende triagestudies werd beoogd bij te dragen aan de kwaliteit van de besluitvorming in het triage proces. De uitkomsten van de studies vormen de basis voor een conceptueel model van de professionele en organisatorische aspecten van triage voor geriatrische revalidatie.

H**oofdstuk 2** beschrijft de kwalitatieve studie naar 'voorkeuren van oudere chirurgische patiënten voor nazorg'. Beslissingen over de noodzaak van vervolgzorg aan het einde van een ziekenhuisopname kunnen de confrontatie met chronische beperkingen en blijvende zorgafhankelijkheid oproepen. Het doel van dit onderzoek was om een beter inzicht te krijgen in de houding en eigen overwegingen van oudere patiënten ten aanzien van hun

behoefte aan nazorg. Op een operatieafdeling werd gedurende drie maanden veldwerk gedaan. Deelnemers aan het onderzoek waren oudere, postoperatieve patiënten van wie werd verwacht dat ze na ontslag herstelgerichte nazorg nodig zouden hebben. Gesprekken met patiënten hierover en ontslaggesprekken tussen zorgverleners werden geobserveerd, deelnemende patiënten werden geïnterviewd en medische dossiergegevens met betrekking tot ontslag uit het ziekenhuis werden bestudeerd. Door middel van inductieve thematische analyse werden vijf dieperliggende behoeften geïdentificeerd: veiligheid, vertrouwdheid, onafhankelijkheid, continuïteit en bevrijding. Deze concepten kunnen als gesprekskader worden gebruikt in ontslaggesprekken. Het aan de orde stellen van de individuele dieperliggende behoeften zou patiënten kunnen helpen bij het verwoorden van hun overwegingen en voorkeuren ten aanzien van vervolgzorg en bij het structureren van die informatie in dossiers en overdrachten. Deze benadering beoogt patiënten en families in hun deelname aan de besluitvorming te bekrachtigen.

Hoofdstuk 3 beschrijft een literatuur review van triagefactoren bij acuut opgenomen oudere ziekenhuispatiënten. Het doel van het onderzoek was het creëren van een overzicht van items, instrumenten en methoden die betrekking hebben op het doorverwijzen van ziekenhuispatiënten naar geriatrische revalidatie. Een scoping review richt zich op brede onderzoeksvragen en heeft tot doel een synthese van kennis te creëren en de focus van verder onderzoek te definiëren. Het raamwerk van Arksey en O'Malley voor de kwaliteit van scoping reviews werd gevolgd in het beoordelen van een breed spectrum aan literatuur waarin het zorgpad van acuut opgenomen oudere patiënten en hun hersteltraject werd gerapporteerd. Na het categoriseren van de geselecteerde abstracts in verschillende geriatrische revalidatiezorgpaden, zoals beroerte, heupfractuur, amputatie, long, cardio- en oncologische revalidatie, werden de 29 abstracts over internistische patiënten verder beoordeeld. Hiervan waren 13 studies gericht op factoren die revalidatiebehoeften identificeren en 16 op factoren die verband houden met de uitkomst van geriatrische revalidatie. We hebben de beschreven factoren gecategoriseerd in demografische, diagnose-gerelateerde, mentale, functionele en multi-domein factoren en deze in kaart gebracht in een zorgpad.

In **hoofdstuk 4** introduceren we het DSMS-2019-cohort, bestaande uit thuiswonende oudere patiënten die acuut waren opgenomen in één tertiair ziekenhuis. Het 'Dutch Safety Management System' (DSMS) schrijft een kwetsbaarheidsscreening voor bij 70+ patiënten wanneer zij in het ziekenhuis worden opgenomen. Alle patiënten van 70 jaar en ouder, die tussen 15 januari en 15 mei 2019 werden ontslagen uit het studie ziekenhuis zijn geïncludeerd in het cohort. Om de kenmerken te bestuderen van patiënten die na ontslag naar geriatrische revalidatie werden verwezen, werden demografische en klinische gegevens verzameld, waaronder de DSMS-kwetsbaarheidsscore en de ontslagrichting na verblijf in het ziekenhuis. Gegevens werden geanalyseerd in groepen met verschillende ontslagbestemmingen: 'Thuis', 'Geriatrische revalidatie' en 'Overige verpleeghuiszorg'. Van de 491 ontslagen uit het ziekenhuis keerden 349 patiënten (71,1%) terug naar huis, 60

(12,2%) werden doorverwezen naar geriatrische revalidatie en 82 (16,7%) naar andere intramurale postacute zorg. De verwijzing naar vervolgzorg vanuit het ziekenhuis nam toe met de leeftijd van 21% (70-80 jaar) naar 61% (>90 jaar). Een chirurgische diagnose (odds ratio [OR] = 4,92; 95% betrouwbaarheidsinterval [BI], 2,03-11,95), functionele achteruitgang vertegenwoordigd door Katz-ADL positieve screening (OR = 3,79; 95% BI, 1,76-8,14) en positief valrisico (OR = 2,87; 95% BI, 1,31-6,30) waren geassocieerd met ontslag naar vervolgzorg. De Charlson Comorbiditeiten Index toonde geen significant verschil tussen de groepen. De uitkomst van de DSMS-kwetsbaarheidsscreening kan wijzen op een complex ontslag uit het ziekenhuis en biedt de mogelijkheid om eerder in het ziekenhuistraject over de noodzaak van nazorg te communiceren.

In **hoofdstuk 5** doen we verslag van de subgroep geriatrische revalidatie, voortkomend uit het DSMS-2019 cohort en bestaande uit alle patiënten, die bij ontslag uit het studie ziekenhuis werden verwezen naar herstelgerichte nazorg. Tijdens de inclusieperiode van 15 Januari tot 15 Mei 2019 nodigden liaisonverpleegkundigen alle patiënten die herstelgerichte nazorg nodig hadden uit om deel te nemen aan het onderzoek. Het inclusiecriterium voor dit onderzoek was: 'doorverwezen worden naar herstelgerichte nazorg, zoals geriatrische revalidatie, kortdurende herstelzorg of revalidatie in de langdurige zorg'. Deelnemers gaven toestemming om hun ziekenhuis- en revalidatiedossier te bestuderen. De gemiddelde leeftijd van alle 87 verwezen patiënten was 76,3 jaar. Van de verwezen patiënten, startten 73 patiënten in een herstelgericht zorgtraject, van deze patiënten werden 60 (82%) naar huis ontslagen. Leeftijd, alleen wonen, mobiliteit voor ziekenhuisopname, comorbiditeiten, complicaties tijdens het nazorgtraject en het aantal determinanten van sociale kwetsbaarheid verschilden in ontslagbestemmingsgroepen, evenals de kwetsbaarheidsscore op somatisch, psychisch en sociaal gebied. De DSMS-kwetsbaarheidsscore, afgenomen bij ziekenhuisopname was niet geassocieerd met de ontslagbestemming na revalidatie. Door patiënten te volgen van ziekenhuisopname tot ontslag na herstelgerichte nazorg, konden we associaties bestuderen tussen de patiëntkarakteristieken voor opname, de morbiditeitsgegevens, fysieke, sociale en psychologische kwetsbaarheidsdeterminanten en de uitkomst van herstelgerichte nazorg. Hoewel deze bevindingen met voorzichtigheid moeten worden geïnterpreteerd, gezien de steekproefomvang en het grote aantal betrokken postacute zorgfaciliteiten, bieden ze een voorlopige oriëntatie in de besluitvorming over nazorg. De associatie tussen sociale kwetsbaarheidsdeterminanten en revalidatie-uitkomst vereist zorg die op deze individuele behoeften is gericht.

In **hoofdstuk 6** rapporteren we een nationaal onderzoek naar de praktijk van besluitvorming over verwijzing naar GR in Nederland. Het onderzoek richtte zich op professionele bijdragen, betrokkenheid van patiënten en naasten en het gebruik van triage-items, factoren en meetinstrumenten. In dit onderzoek werden twee onderzoeksvragen beantwoord:

1. Welke ziekenhuis- en/of revalidatieprofessionals zijn betrokken bij de besluitvorming over GR-verwijzingen en welke triagemethoden worden daarbij gebruikt?

2. Welke niet-klinische factoren zijn geassocieerd met het proces van verwijzing naar GR?

Ziekenhuis- en geriatrische revalidatieprofessionals in Nederland namen deel als respondenten, die als groep de 'zendende' en 'ontvangende' professionals vertegenwoordigden. Er werd gebruik gemaakt van een uitgebreide web-based vragenlijst met open -, meerkeuze - en gesloten vragen, waarbij in detail werd uitgevraagd hoe de beoordeling werd uitgevoerd bij ziekenhuispatiënten die een nazorgbeslissing nodig hadden. Een ander deel van de vragenlijst ging over organisatorische aspecten van triage. Kwantitatieve data werd geanalyseerd middels beschrijvende statistiek en kwalitatieve gegevens door middel van deductieve codering.

In totaal namen 104 transferverpleegkundigen (66.7%) en 52 GR-professionals (33.3%) deel. De respondenten waren redelijk tevreden over de huidige triagepraktijk. Transferverpleegkundigen waardeerden hun operationele verantwoordelijkheid voor triage in het ziekenhuis. Geriatrische revalidatieprofessionals wilden actief betrokken worden bij de besluitvorming en achtten de paramedische expertise van het ziekenhuis suboptimaal vertegenwoordigd bij triage. Door 50,0% van de GR-respondenten werd 'te weinig betrokkenheid' van patiënten en families' gevoeld versus 15,5% van de ziekenhuisrespondenten. Het belang van de helft (47,8%) van de triage-items werd verschillend beoordeeld tussen de respondentgroepen. Bij bespreking van complexe casussen tussen verwijzende en ontvangende professionals werden hun verschillende perspectieven als complementair ervaren. De stem van de patiënt en diens naasten wordt mogelijk onvoldoende gehoord bij triagebeslissingen. Deze studie biedt ingrediënten om tot een interprofessionele visie te komen op besluitvorming na acute zorg en verwijzing naar geriatrische revalidatie.

In **Hoofdstuk 7**, de algemene discussie, wordt het 'probleem GR-triage' opnieuw geschetst waarbij gereflecteerd wordt op de resultaten van de triagestudies en de beperkingen die we daarin tegenkwamen.

Triage als onderwerp heeft kenmerken van een 'wicked problem'. Op basis van de resultaten van de triagestudies konden elementaire stappen in een GR-triageproces beschreven worden. De onderdelen van deze opeenvolgende stappen werden verder weergegeven met behulp van voorwaarden en aanbevelingen in drie dimensies: 1) patiëntenzorg; 2) vakbekwaamheid; 3) organisatorische aspecten. Dit conceptuele triagemodel heeft nog geen consultatie in het veld van beroepsbeoefenaren ondergaan, noch is het in een bredere context geëvalueerd door triage betrokkenen, zoals oudere patiënten, hun naasten, multidisciplinaire GR-teams, medisch specialisten, ziekenhuis- of zorginstellingsmanagers, zorgverzekeraars en beleidsmakers. Implementatie van het hier gepresenteerde triagemodel zou de kwaliteit van de besluitvorming kunnen ondersteunen en de evaluatie van de GR-triagepraktijk kunnen vergemakkelijken. Implementatie en evaluatie kunnen daarmee de grondslag vormen voor de ontwikkeling van een veldstandaard triage voor geriatrische revalidatie.

Curriculum vitae

Aafke Johanna de Groot werd geboren op 13 April 1958 in Deventer. In Zutphen behaalde zij haar eindexamen Gymnasium bèta aan het Baudartius College, waarna zij in 1975 aan de Vrije Universiteit geneeskunde ging studeren. Gedurende de geneeskunde studie vervulde zij student assistentschappen Sociale geneeskunde en Huisartsgeneeskunde en werkte ze mee aan publicaties over 'buurtgericht werken door de huisarts' en 'academisering van de eerste lijn'.

Na haar afstuderen werkte ze als specialist ouderengeneeskunde in Amsterdam, Hilversum en Naarden, als arts op de (Parkinson) dagbehandeling en steeds meer extramuraal, in meerzorg projecten en als consulent ouderengeneeskunde voor huisartsen in de regio. Via haar opleiderschap raakte zij betrokken bij de opleiding tot specialist ouderengeneeskunde aan de VU, waar zij in 2003 docent somatische nascholing werd.

In de periode 2010-2014 was zij intensief betrokken bij de start van de proeftuinen geriatrische revalidatiezorg en het daarmee verbonden SINGER onderzoek. Ook richtte zij zich als docent op de ontwikkeling van de kaderopleiding voor specialisten ouderengeneeskunde in dit aandachtsveld. Na een voorstudie over triage onder de kaderartsen in opleiding, startte zij haar promotie onderzoek. Parallel hieraan geeft zij nog steeds nascholingen op locatie over triage en transitiezorg, waarbij 'verwijzende' en 'ontvangende' triagisten met elkaar in gesprek kunnen gaan.

Naast de ouderenzorg zijn schrijven, taal en poëzie haar passies. Zij verzorgt de poëzie rubriek van Gerõn, en van het Nederlands Tijdschrift voor Literatuur en Geneeskunde.

Portfolio

Name	Date achieved	EC
EXTERNAL COURSES		
Epidemiologisch onderzoek: opzet en interpretatie V10	31-01-2019	1.36
Academic writing	11-06-2019	3.00
Critical choices in qualitative research	01-11-2019	2.00
Research integrity biomedical sciences	30-08-2020	2.14
GNK-CCA-mandatory- Statistics course	21-02-2025	0.60
GNK-APH-elective mandatory-research meetings, expert meetings, seminars	23-04-2025	1.00
RESEARCH RELATED		
EUGMS 2018 Berlin	12-10-2018	2.00
EUGMS 2019 Krakow	27-09-2019	2.00
Medical Humanities, 2020 Oxford	15-03-2020	2.00
EUGMS 2021 Athens	13-10-2021	2.00
Verenso GRZ Covid-19 behandeladvies	01-03-1922	0.86
EUGMS 2022 London	30-09-2022	2.00
Reviewing for indexed journal:		
Discover Social Science and Health	02-07-2024	0.25
BMC Musculoskeletal disorders	27-10-2024	0.25
BMC Medicine	01-12-2024	0.25
BMC Geriatrics	02-12-2024	1.00
Discover Public Health	18-12-2024	0.25
BMC Geriatrics	18-03-2025	0.25
Humanities and Social Sciences Communications	28-04-2025	0.25
European Journal of Aging	07-05-2025	0.25
OTHER ACADEMIC ACTIVITIES		
Geriatriedagen 2018	09-02-2018	0.25
Leidraad triage na CVA	04-12-2020	1.00
APH spring meeting	22-04-2024	0.50
Triage voor geriatrische revalidatie	22-05-2024	1.00
Annual Care days Eindhoven	30-05-2024	1.00
Presentatie op V&VN congres	05-04-2025	1.00
Presentatie op Verenso congres	17-04-2025	1.00
Congres Geriatrische Revalidatiezorg	22-05-2025	1.00
TEACHING/STUDENT SUPERVISION		
Begeleiden AIOS wetenschapstage	30-11-2020	1.00
Masterstudent begeleiding	31-05-2021	1.00
Begeleiding student bachelor thesis	02-06-2023	1.00
Colleges en nascholing	23-12-2024	2.00
Total number of ECT credits		**35.46**

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Dankwoord

In de totstandkoming van dit proefschrift waren mijn ervaringen als arts in de ouderenzorg een essentiële en continue onderstroom. Dit proefschrift is -hoe kan het anders- uit deze ervaringen ontstaan en het is daarmee verbonden gebleven. Zorg in de praktijk en ook onderwijs waren de bronnen die mij steeds weer positieve energie gaven om verder te reizen door het onderzoekers landschap. In Wittenberg Amsterdam leerde ik als vers gestarte basisarts medische verpleeghuiszorg verlenen en organiseren, jaren later mocht ik in Naarderheem zorg 'buiten de muren' helpen versterken. Bij Gerion leerde ik onderwijs aan en met groepen te geven en in de dynamiek van het enerverende geriatrische revalidatie proeftuinen project (SINGER) begon onderzoek steeds meer in mij te kriebelen. Het opzetten van de kaderopleiding voor geriatrische revalidatie in Amsterdam versterkte dit. Allen die in al deze jaren met mij meeliepen en meedachten, collega's van vroeger, van nu, collega's van altijd die ook vrienden werden, jullie allen ben ik intens dankbaar voor jullie visie, hulp, losse opmerkingen, doordachte kritiek, grappen, vriendschap en bemoediging. Jullie lieten mij steeds weer beseffen dat triage een belangrijk thema was.

Nu het triage proefschrift klaar is kunnen we even stil houden en over onze schouder kijken. Cees, Hans, Romke en Lizette, jullie werden in het 'Onderzoeksproject Triage' samen gedwarreld tot 'mijn' projectgroep, min of meer 'like seeds of the weeds in an Autumnwind'[1]. Beste Cees, promotor, en daarvoor vele jaren collega in de zorgpraktijk van Naarderheem, en daarvoor studiegenoot aan de VU, van jou mocht ik deze jaren eigenlijk nergens anders mee bezig zijn dan met mijn proefschrift. Ineens was je mijn baas geworden! Jouw kritische relatie tot geriatrische revalidatie heeft hopelijk een verantwoorde benadering van het thema 'triage' teweeg gebracht. Dank voor je steeds verrassende, analytische scherpschutter blik. Over de zorgethiek achter triage praten we vast nog verder. Beste copromotor Hans, lang, lang, lang-lang-lang geleden[2] kwam ik met een onsamenhangend lijstje triage-variabelen en meetinstrumenten voor het eerst bij jou praten over 'onderzoek doen'. Jouw reactie ben ik niet vergeten. Je zei droogjes: 'als je wilt publiceren moet je het wat netter op schrijven'. Jij hebt sindsdien op die netheid toegezien en ik heb daar ook heel hard mijn best op gedaan. Jouw scherpzinnige, 'to the point', no nonsense, oplossingsgerichte en gelukkig vaak ook kameraadschappelijke hulp weerhield mij van vele methodologische dwalingen en redde mij van al te grote fantasieën. En hoewel jouw Cochrane-ziel botste met mijn associatieve brein, bleef je rustig doorgaan met begeleiden en vonden we steeds wel weer 'common ground'. Heel veel dank! Beste copromotor Romke, jij was in Nederland en Europa de grondlegger van ons onderwerp 'triage'. En je bent vooral ook een zeer bescheiden gebleven, zeer ervaren specialist ouderengeneeskunde met een Rotterdams revalidatie hart. Jouw expertise als senior onderzoeker in dit veld, maar zeker ook jouw praktische revalidatie kennis heeft mij geholpen om triage inhoudelijk zo goed mogelijk neer te zetten. Dankjewel! Lieve Lizette, wij pluisden samen wekenlang de duizenden 'Scope artikelen' uit. Ook daarna, en

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Dit proefschrift heeft kunnen doorgroeien dankzij ontmoetingen op parallelwegen en kruispunten in de ouderzorgwereld. De vele verhuizingen van onze en andere afdelingen binnen OZW en MF droegen op eigen wijze daar aan bij; met talloze andere onderzoekers kon ik tijdelijk kamers en flexplekken delen, wat veel gelegenheid gaf om praktische promovendus-vragen door te nemen, samen te klagen en stapjes vooruit te vieren. Het was ook fijn om met Anne Marie en Alirheza als 'senior-promovendi' die specifieke ervaringen te delen, om te kunnen sparren met GRZ-collega's (Jeannine, Astrid, Eskeline, Annemarie, Margriet), en om altijd hulp te kunnen vragen aan Karin. Dank allemaal!

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Het proefschrift is klaar, voilà! Het is ten lange leste gelukt. Zeer geliefde paranimfen van deze dag, Wilma voorbeeldvrouw-vriendin en Jan Ad bijna-broertje, lieve andere

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1. Kate and Ann McGarrigle. The Jigsaw Puzzle of Life.
2. Six days, seven nights. (Ivan Reitman, 2014) In deze luchtig-komische film belandt Harrison Ford op een onbewoond eiland met vele uitdagingen, waaronder de omgang met zijn mede drenkeling.
3. 'Not evidence based' is een lichtvoetige reflectie methode om poëzie en geneeskunde praktijk met elkaar in verbinding te brengen.
4. Nederlands Tijdschrift voor Literatuur en Geneeskunde. (www.literatuurengeneeskunde.nl)
5. Britse film (Fernando Mereilles, 2005) met Ralph Fiennes als wetenschapper die door zijn politieke opstelling in gevaarlijk vaarwater komt.

Jaarlijks volgen ruim 50.000 mensen een revalidatietraject in een verpleeghuis, meestal in aansluiting op een acute ziekenhuisopname. Dit proefschrift gaat over triage, het indicatie stellen voor geriatrische revalidatiezorg. Triage is een onderdeel van het proces van ziekenhuisontslag en beoogt een veilige transitie te realiseren naar de best passende zorgsetting.

Hoe wordt deze triage gedaan, welke medische en andere criteria spelen een rol, hoe kunnen we de benodigde informatie voor deze besluitvorming goed bij elkaar brengen en volledig communiceren met de vervolginstelling en hoe zijn patiënten en hun naasten zelf betrokken bij wat er besloten wordt? In dit proefschrift wordt verslag gedaan van verkennende studies naar deze vragen.

Met de uitkomsten daarvan werd een concept-model triage opgesteld dat de uitgangspunten verwoordt voor een zorgvuldig triage onderzoek van de patiënt, de competenties van de triage-verantwoordelijke professionals en de organisatorische randvoorwaarden voor triage. Beoogd wordt hiermee een wetenschappelijk gefundeerde aanzet te geven tot consensus tussen transferverpleegkundigen en specialisten ouderengeneeskunde, die beiden verantwoordelijk zijn voor de kwaliteit van triage. Toekomstig onderzoek richt zich op het implementeren en evalueren van een 'Best-practice Triage' die gebaseerd is op de hier geformuleerde uitgangspunten. Door de indicatiestelling voor geriatrische revalidatie te verbeteren ontstaat meer zicht op de case-mix en wordt evaluatie van de uitkomsten van geriatrische revalidatie beter mogelijk.